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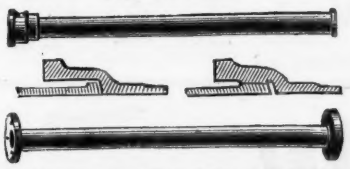

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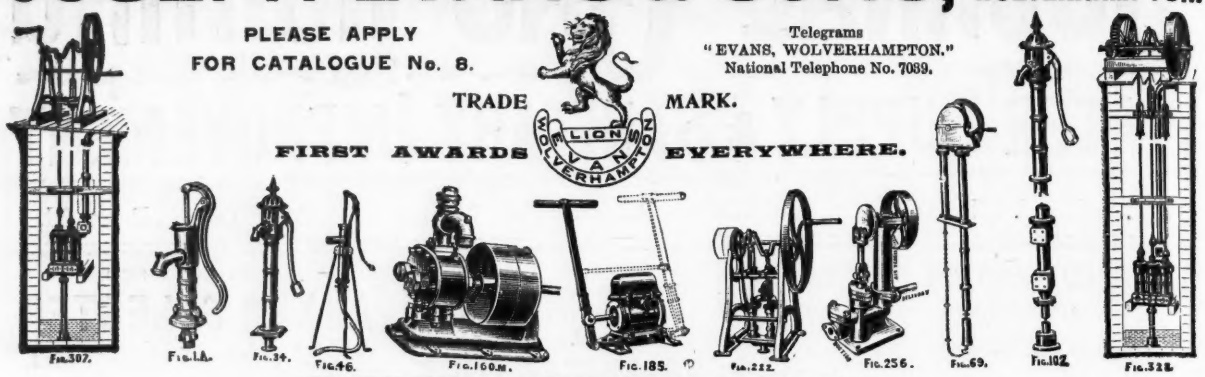

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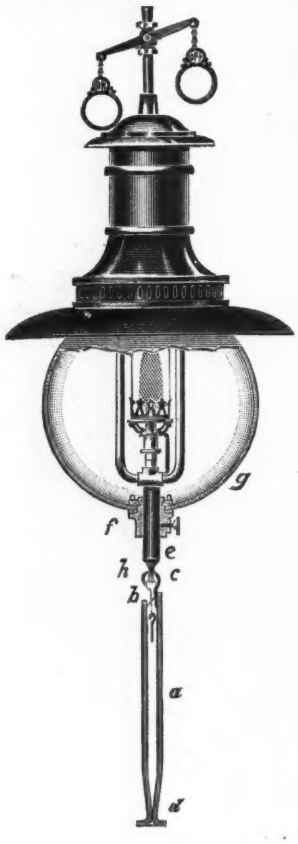

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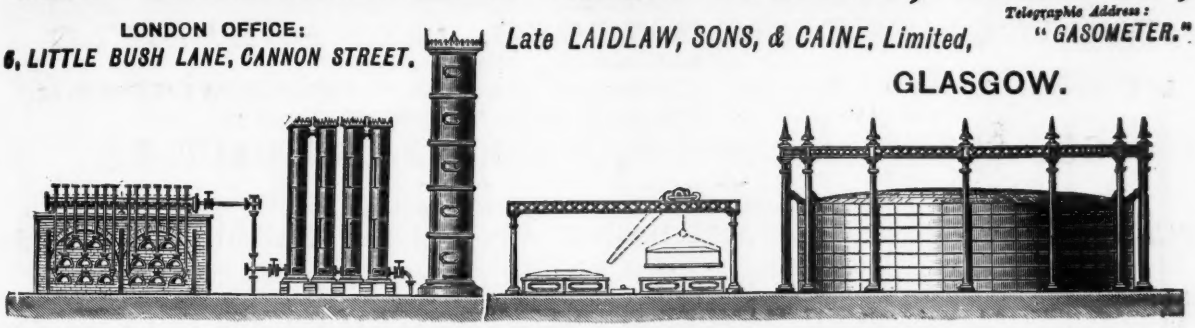

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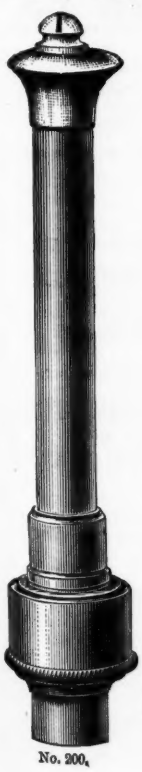

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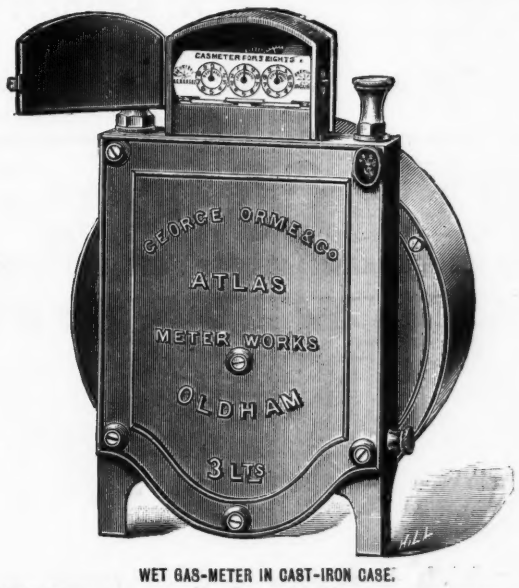

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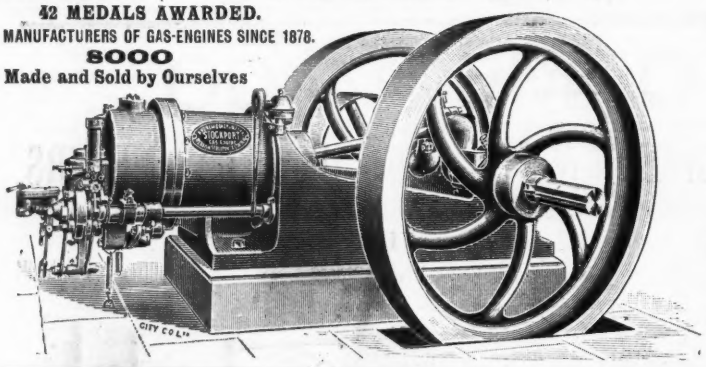

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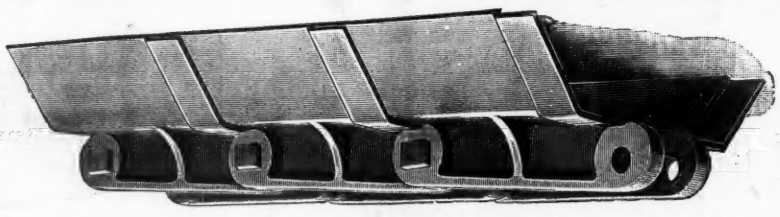

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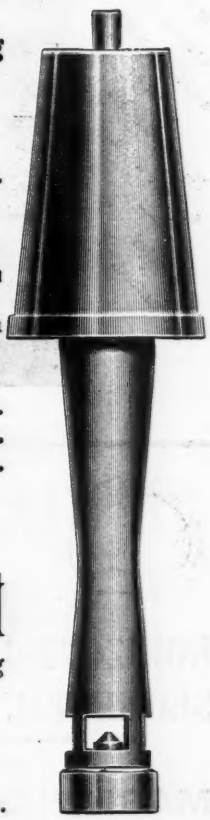

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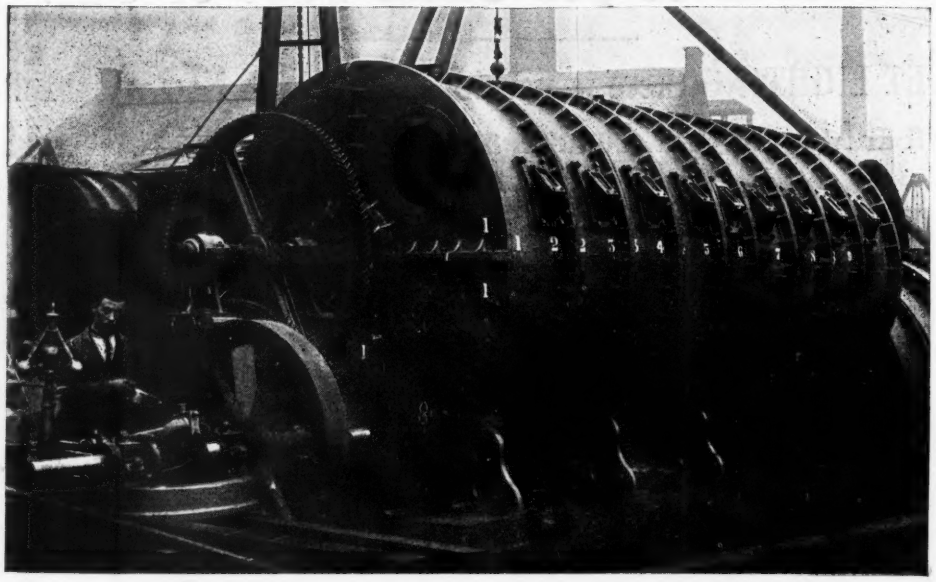

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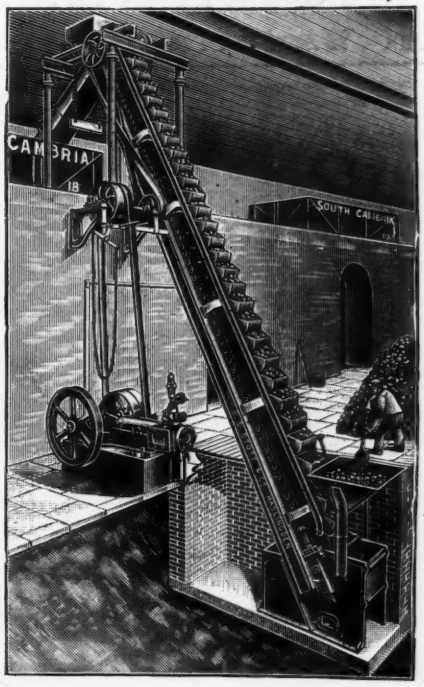

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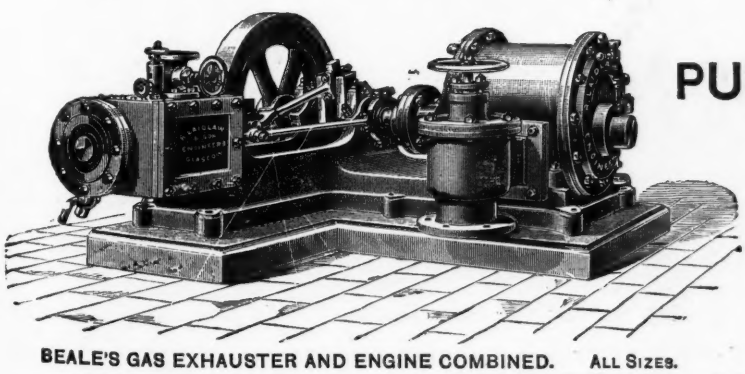

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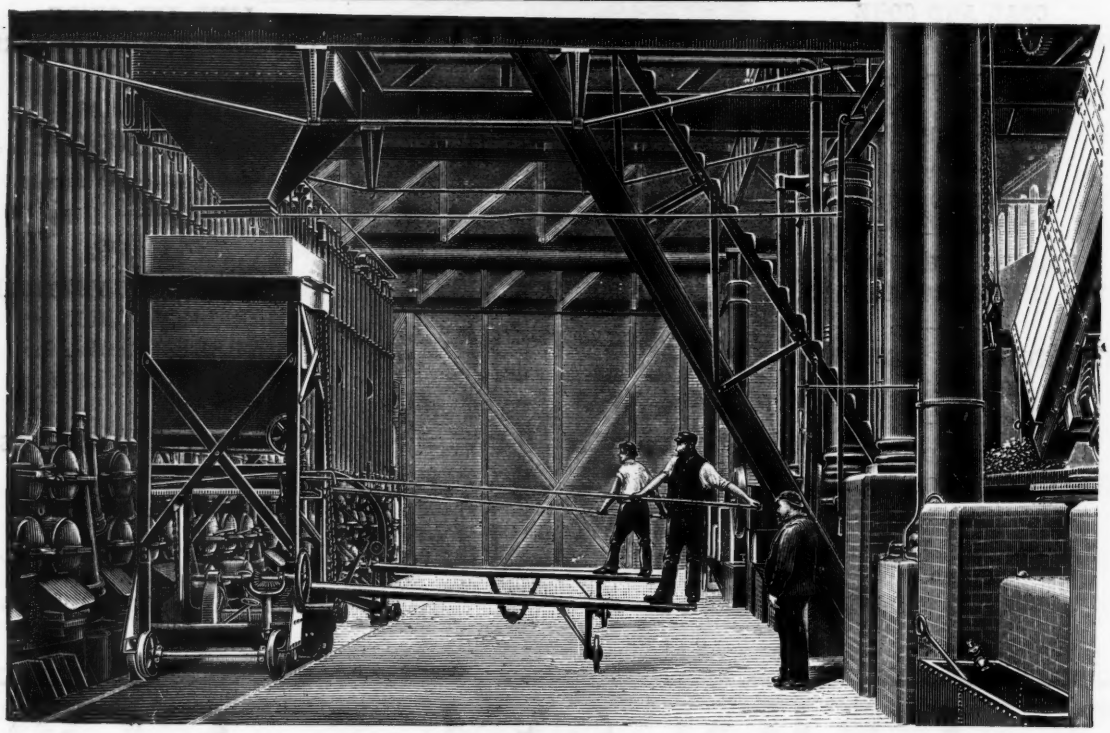

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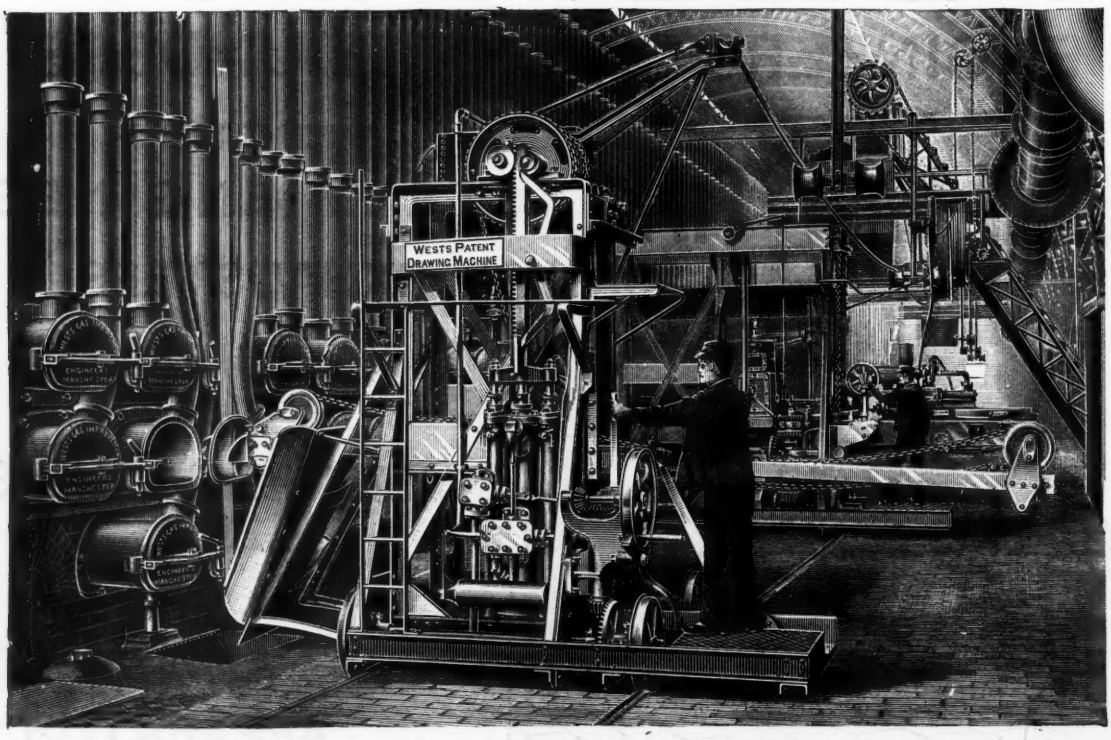

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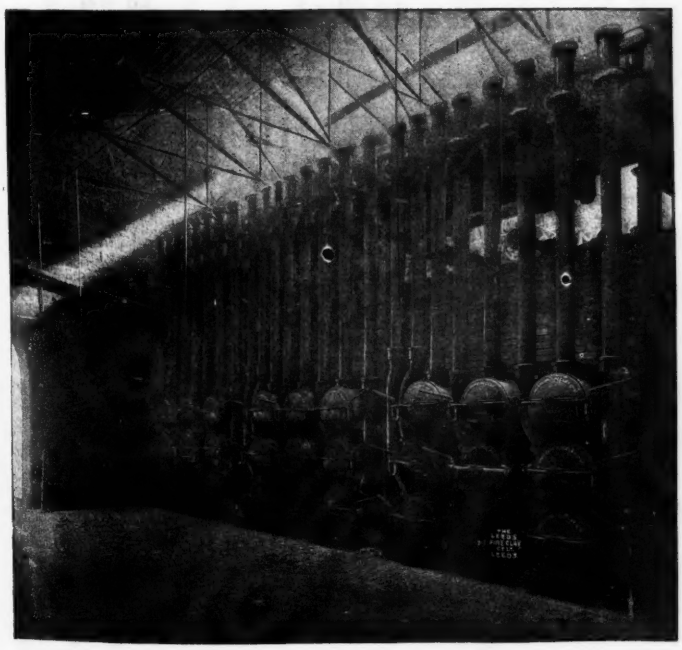

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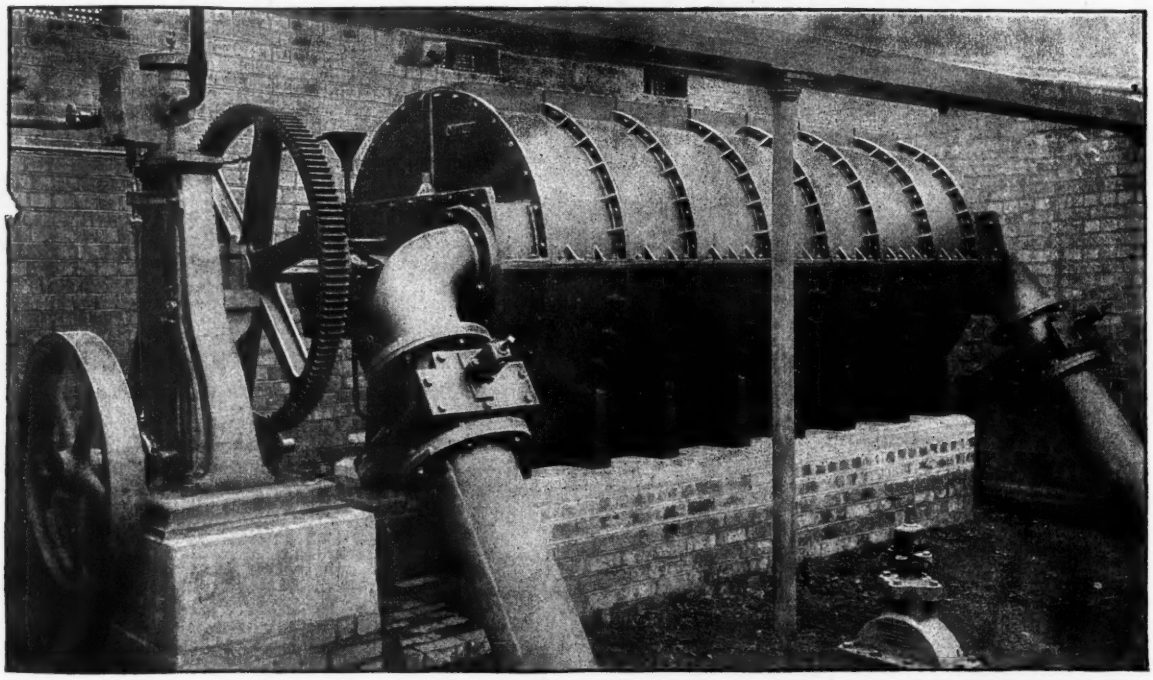

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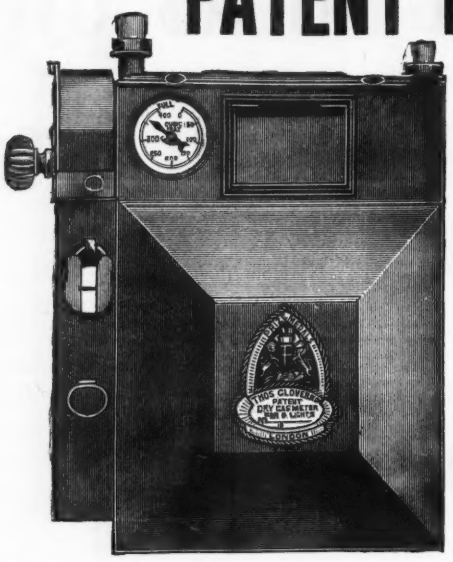

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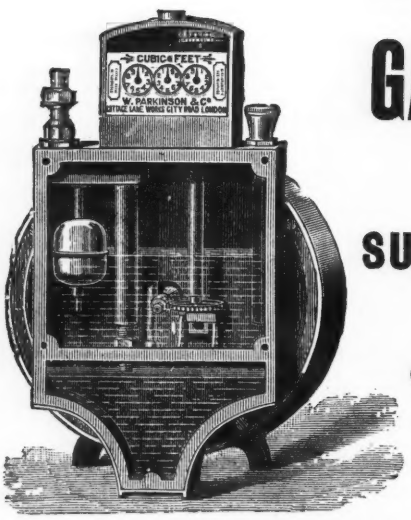

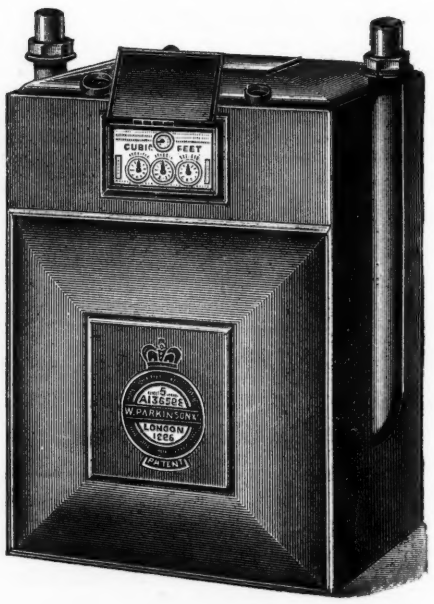

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EDITORIAL NOTES.

The Report and Accounts of The Gaslight and Coke Company.

THE report of the Directors of The Gaslight and Coke Company on the operations of the undertaking for the past half year was published in last week's "JOURNAL." After setting forth the principal figures bearing upon the dividend, which have already been commented upon, the report goes on to admit a reduction of 2·1 per cent. in the sale of gas, as compared with the business done in the corresponding half of 1897. This is explained by referring to the "phenomenally warm and bright weather, with almost "entire absence of frost and fog, of the past six months." Last year was warm and bright too. The falling off of gas consumption has been accompanied by an increase in the number of consumers; but for which consolatory circumstance the affairs of the Company might have looked darker. It is a matter of conjecture what sort of season would now be required to once more send up the consumption of gas in the Company's district by "leaps and "bounds." The true interpretation of the position is probably that the Company have lost a large number of their best accounts in the central districts for one reason or another, and are only growing on the outer belt. They have not literally lost the consumers, inasmuch as the names remain on the books; and the meters, which cost the consumers nothing, are in position with a view to emergencies. It might be asked if the other London Gas Companies have experienced anything like the same injury from meteorological influences as those that have weighed so disastrously upon The Gaslight and Coke Company. The report states that the prices obtained for the principal residual products have so much improved that the increase in the Company's revenue under this head "has been more than sufficient to meet the additional "expenditure caused by the increased price of coal." This being the case, a financial contemporary inquires why the Directors put that extra 2d. on the price of gas. Carbonizing wages having gone up 7½ per cent., the Directors "have decided upon a further expenditure of capital" on labour-saving plant. More capital is also required to provide for the needs of the new consumers. It was supposed that the heavy capital expenditure of the past few years had some reference to future requirements; but evidently not in these two respects. All that is certain is that when the Company want any improved mechanical carbonizing appliances and more distributing fittings, fresh capital has to be raised for the purpose. Last half year, a gross amount of £148,718 went as expenditure on capital account; while the amount outstanding on the automatic meter supplies (fittings account) rose further to £299,902.

By the revenue account, it appears that the sale of gas at 3s. and 2s. 3d. per 1000 cubic feet brought in £1,516,610, as compared with £1,471,457. Coke improved from £202,908 to £254,485. Sulphate was more than £10,000 better. On the other hand, tar dropped again by upwards of £6000. Altogether, residuals improved from £313,355 to £371,336. The gross revenue was raised by these means from £1,804,104 to £1,912,785. This is a very big lift towards equalizing the two sides of the account, having regard to the requirements of interest and dividend. But unfortunately, the other side of the sheet shows that more money was needed to carry on the business. Coals rose from £596,433 to £634,037. Wages (carbonizing) went down from £168,827 to £160,273; there being, unfortunately, less to do. There is a new entry in the account—of £2500 on "workmen's compensation account," which is presumably for self-insurance under the Act. The net result, as already known, is that the Directors have just managed to make both ends meet; the carry-forward being only increased from £51,854 to £53,759, which is practically nothing for so huge an account. The shareholders have suffered a diminution of dividend of £14,267; and the private consumers of the northern district have paid (say) £46,000 more in dearer gas, as their contribution towards making up the deficit. It is not often that the sliding-scale presents this aspect to the student of the British gas industry; and it is as well that it should be here noted.

We are not inclined to offer any lengthy criticism upon these figures, or to place any interpretation upon their meaning and promise. It is a thankless and hopeless task

for anybody to indicate where anything in the administration of The Gaslight and Coke Company appears to be weak, either with reference to a generally accepted standard of good management or to the results of the contemporaneous working of other undertakings. We remarked last week that the price of gas supplies the only positive datum by which the London Gas Companies will in future be judged by the public. It is a sufficiently severe rule for some administrators, and a great strain upon the existing statutory settlements.

The South Metropolitan Report and Accounts.

In another part of the present issue of the "Journal," we give the report of the Directors and the statement of accounts relating to the working of the South Metropolitan Gas Company during the past half year. The former document is, if anything, of a more argumentative cast than usual. In the amount and variety of their confidences, the Directors of the South Metropolitan and of the Commercial Gas Company supply, in their respective half-yearly reports, examples of the two extremes. The latter is always stereotyped; the former is very much the opposite. There is something to be said, of course, for both patterns; and we are not going to pronounce between them on the point of principle. The South Metropolitan report is the reverse of apologetic. Indeed, its tone is buoyant to the verge of boisterousness. There has been a prosperous season for gas in South London. The gas consumption has gone up 5 per cent.; and there has been a welcome revival in the value of coke and ammonia. The dividend has been earned; and there is a carry-over of £27,309. The reserves of different kinds have now been made up to the substantial figure of £179,369. The report confirms the understood success of the profit-sharing scheme, under which the employees hold a stake valued at £80,000 in the undertaking. The results of the experiment of Workmen Directors are declared to be so far satisfactory. Lastly, the report mentions the reduction in the price of gas that came into force with the beginning of the current quarter, and justifies the excess charge of 9d. per 1000 cubic feet for prepayment meter supplies.

The accounts are made out to exhibit the effect of the stock conversion, showing both the actual and nominal amounts of capital of the undertaking. The revenue from gas sold at 2s. 3d. per 1000 cubic feet reached the handsome figure of £514,519. No electric lighting has so far trenched upon the Company's rapidly-filling domain, either for public or private purposes. Coke has risen splendidly; and the residuals altogether have gone up from £139,945 to £191,409. Even tar has participated in the advance. On the other side, coal has cost the Company £20,579 more; and a heavy addition has been made to repairs and maintenance. Carbonizing wages have been raised, as the report states, by 7½ per cent. It is apt to be misleading nowadays to state manufacturing costs in terms of coal carbonized only; but, taking everything into account, it appears that the South Metropolitan Company managed to manufacture gas for rather less than 1s. 1d. per 1000 cubic feet sold. Why this Company should be able to show such a result, is not for us to explain. Whether they have somebody who knows how to buy coal, or whatever the reason, the fact remains that South Metropolitan gas is cheap to the public chiefly because it is cheaply made, and secondly because the capital expenditure is low. There is no mystery about the matter.

We are not going to occupy time and space in drawing comparisons between the workings of the two London Gas Companies whose accounts we publish this week. That has been done often enough, and the materials are available for whosoever chooses to amuse himself by repeating the exercise. The official view of both statements is, of course, the same—they are both most satisfactory in every respect. It is more suggestive to note that the two gas undertakings are administered under identical statutory provisions for safeguarding the interests of the public. Both produce the same commodity, and manufacture it from the same raw materials. If substantial differences of constitution were discoverable in the cases of these undertakings, those who believe in legislation as a nostrum for the ills of the body politic would be busy. If one of these properties were municipalized and the other not—it does not matter which—what leading articles would be written, and speeches made, upon the effects of the "system" in either case! But we forget—they are both shining examples of the best of all good gas administration. The Directors say so; and who, it may be asked, should know better than they?

Labour Topics of the Week.

The threatened strike in the building trades remains a threat at the moment of writing; but it may be carried into effect by the time we go to press. On the 20th inst., the Secretary of one of the building firms implicated—Messrs. Higgs and Hill, Limited—wrote to "The Times" to call attention to certain important facts of the situation. Stress was laid upon the action of the Plasterers as being a "deliberate breaking of contracts supposed to be honourably made between Masters' Associations and Trade Societies." This statement goes to the root of the present question, just as the action of the Society "queers" all the newspaper and platform talk about compulsory arbitration in labour disputes. We are not likely to hear much more of this "irresponsible chatter" for the present, notwithstanding the much-advertised New Zealand Industrial Arbitration Act, with its questionable operation upon the six-men-and-a-boy factories of Auckland. The militant Plasterers have at least done the community the service of diverting public attention from mere moonshine theories to stubborn facts. They have struck work at three shops, because the employers refused to compel their foremen to join the Union. There is a brilliant rashness about this proceeding which almost commands admiration on the part of those who are not likely to suffer from the probable consequences. The whole profession of Trade Union leaders have been meeting, in the usual way, in Manchester during the past week to air their eloquence and exercise their powers of drawing up programmes on the question of National Federation. This subject has been talked about for years; and many schemes have been promulgated which never got beyond the paper stage. Before they separated, the delegates agreed upon the skeleton of yet another plan of federation, and went away congratulating themselves that the country would take their proceedings seriously. There seemed to be a doubt about this; and reasonably, for Trade Union Congresses rarely lay eggs in fair ratio to the amount of the cackle. Here is a test case: What will the Unions do for the Plasterers? This Society will soon want assistance badly, if they expect to continue on their present course. The employers are closing their ranks and cementing that union and concord among themselves upon the absence of which the strikers are confidently reckoning. The "Progressive" newspapers state that the men have not the smallest intention of yielding their points; so there should be no mistake about what is coming to pass. The employers are united upon the policy marked out by the Central Association of Master Builders, which is to lock out the members of the Plasterers' Union in London first, and probably in the country later, unless they give up their preposterous demands and conform to reasonable rules of work. It is announced that the National Association of Master Builders are to meet to-day to consider the general situation; and this gathering will decide what is to be done to deal with the labour questions of the trade.

One of the difficulties in the way of Trade Union Federation is the disinclination of the big and strong Unions to be mixed up with the smaller and poorer Societies. Yet it is a remarkable thing that some of the most important points of Trade Union politics are brought out by the action of these small Societies. Naturally so, for the big Unions are mostly in the hands of men who are prominent politicians, Socialist speakers and writers, and persons who are working men only in name. Once in a way a heavy strike gives these gentry some Society business to do; but ordinarily they have axes of their own to grind. The small Union secretary or walking delegate, on the contrary, attends closely to business; and it is he who usually figures in the "test" cases, which he perforce fights in the noble classification of a "man of straw," whose Society has everything to gain while he personally has nothing to lose by the judgment. At the Manchester meeting, all this came out in the course of a reference to the picketing case, in which the decision of the Appeal Court went against the practice, as understood by Trade Unions in general and the members of the Fancy Leather Workers' Union in particular. This judgment was described by Mr. Ben Tillett, who ought to know, as inimical to the "safety" of Trade Unions. His companions agreed as one man that

the whole system of Trade Unionism must stand or fall with the practice of picketing, as they understand it—that is, upon legalized intimidation and infringement of the liberty of the subject. Consequently, it was ultimately decided that every Trade Unionist in the country should be asked to contribute one halfpenny to form a fund for defraying the expense of an appeal to the House of Lords. It is to be hoped the money will be forthcoming for the purpose, as it is of the first importance that the law relating to picketing should be settled on the highest authority. At present, the Unions attach a most elastic meaning to the well-known decision of the Court that picketing for the purpose of collecting and imparting "information" is not illegal. A case in point recently occurred in Birmingham, where a man was assaulted upon leaving a shop where a strike was going on. The shop was picketed by gangs of nine or ten men, who, in pairs, under a "captain," paraded the street opposite the shop. The man said that two of the pickets struck him; but the defence was the good old trick of an "alleybi." Of course, the Society that organized the strike and posted the pickets "did not desire in any way "to justify an assault, or to assist any of the men engaged "in it." They, however, provided legal aid for the defence; and in the event the Magistrates, who seemed to enjoy a childlike innocence of the ways of pickets, dismissed the summons. It is not a decision that sheds much glory upon the Birmingham Bench.

Killed by "High-flash" Oil.

ANOTHER illustration of the emptiness of the "flash-point" agitation in regard to burning oil was supplied by the evidence at an inquest held yesterday week by the Coroner for the City of London, on the body of a child who was burnt to death in Bermondsey on the previous Thursday. The story told at the inquiry was a very pitiful one. The child was in bed in a room lighted by a tin lamp of "flimsy "construction, and with a double burner." Suddenly the child's aunt, who was watching in the room, saw the lamp "all ablaze; and when she went to lift it from the wall, it "burnt her hands, and she dropped it." It fell upon the bed where the deceased was, setting it alight; and he was so severely burnt that he died shortly afterwards. The Inspector of the London County Council said that "the "oil used in this lamp flashed at 103°," or 2° below the point recommended by the County Council. "The great "fault was in the lamp, which was a very common one. "The great heat generated by the double-flame burner had "melted the solder attaching the worm into which the "burner was screwed to the lamp." What had the flash-point to do with this accident? It had this much to do with it—the high-flash oil developed so much heat in burning that the lamp melted under it. Here we have the cause of the *Goliath* training-ship fire repeated; the high-flash oil being exhibited as itself a source of danger. It cannot be supposed that the County Council Inspector wished the Coroner's Jury to understand that if the flash-point of the oil in this case had been a couple of degrees higher, just to satisfy the fancy standard of the County Council, the accident would not have happened. As it was, the flash-point of the fatal oil was 3° above the standard recommended by the Petroleum Committee. According to the theory of the partisans of the high flash-point, this accident ought never to have occurred. Mr. Ure told his Broxbourne constituents the other day that he intended to reintroduce in the coming session his Bill for raising the flash-point to 100°, "and to combat the argu-"ments urged against it." Unhappily, the death of little Francis Morrissey, in the manner now recorded, is an argument that Mr. Ure will find it hard to meet. If the object of raising the legal flash-point of burning oil to 100°, and thereby upsetting the whole of a vast trade, is not to render lamps safe, what is it? And if oil flashing at 103° is not safe, as shown in this instance, what becomes of the argument for a flash-point of 100°? A week or two back—to be precise, on the 10th inst.—a retail oilman confided to the "Daily Chronicle" (which belongs to the high-flash party), his misgivings that merely raising the flash-point of lamp oil to 100°, or even 105°, without improved construction and better care of lamps, would not avail to prevent lamp accidents. In reply, he was loftily assured that he might make his mind quite easy upon the point, for the Editor of the "Daily Chronicle" was perfectly satisfied that safety lay in the flash-point recommended by the Petroleum Committee. This inquest is the rejoinder. It should hardly be necessary to point out that one such case completely knocks the bottom out of the pretensions of the high-flash party. They have pinned their faith to their prescription, and must abide by it. If they shift their ground, and say "Oh! well, of course, a good lamp is indispensable," they give themselves away at once. For that is the position of those who have consistently refused to accept the assertion that safe lamp-light is a function of the flash-point of the oil. It were superfluous to argue that if the room in which he slept had been lighted by gas, little Francis Morrissey would in all probability have been living now; but it might even be possible to argue that he might have been spared if the oil in the lamp had been cooler in burning—that is to say, if it had been the common kerosene, flashing at a little over 73° Fahr., known variously to Fame as "Tea Rose" oil.

WATER AND SANITARY AFFAIRS.

WHEN the Royal Commissioners charged with the inquiry into the Metropolitan Water Supply resumed their sittings at the commencement of last week, the London County Council created another surprise equal to that which they produced just a week earlier. On the former occasion, Mr. Balfour Browne, Q.C., representing the Council, offered "serious objection" to the course proposed by the Commissioners in appointing Colonel Rathborne as an Assistant-Commissioner to aid their inquiry with respect to the estimates for the Welsh and Thames schemes. The learned Counsel "deprecated very much" such a result as the Colonel anticipating the action of Parliament by any report upon the Welsh scheme, and said he did not think the Council would like to submit witnesses for examination before Colonel Rathborne. This was understood by the Press generally to signify that the Council would have nothing to do with the Assistant-Commissioner; and the attitude of the Council in this respect was decidedly disapproved. If Mr. Balfour Browne's remarks had any meaning at all, and possessed any authority, the strictures of the Press, including our own comments, were fully warranted. Neither was there any withdrawal of Mr. Balfour Browne's protest at the sitting of the Commission on the following day. But six days later, the learned Counsel came before the Commissioners saying that he took "the earliest opportunity" of stating that, if anything which had been said by him the week before conveyed the impression that the County Council were not going to give any information to Colonel Rathborne, this idea was "entirely erroneous." The Council would be glad to give the Assistant-Commissioner any information which might be desired, and Sir Alexander Binnie was already in communication with Colonel Rathborne for the purpose. All's well that ends well; but such a complete *volte-face* on the part of the Council is only to be explained as the result of a discovery that a false step had been taken, and that the Commissioners had public opinion at their back. As we intimated, Colonel Rathborne's assistance would hasten the inquiry, and render the data more complete.

In the course of the evidence given before the Royal Commission last week, Mr. C. E. Groves, Chemist to the Thames Conservancy Board, spoke of the great improvement effected in the state of the river within a period as recent as the last four or five years. Viscount Llandaff inquired for "the dangerous element" in the organic impurity. Mr. Groves replied that he was not aware of any. He could answer for the chemical portion, but his investigations had not extended to the discovery of bacteria. A day later, this witness supplemented his published evidence by a letter to "The Times," showing the ratio of the deaths by typhoid fever to the population in large towns in 1897. While the average of 33 large towns showed 17·85 typhoid deaths per 100,000 of the population, the London ratio was only 13·29. The Manchester ratio was 18·72; Glasgow, 25·04; and Liverpool, 26·54. In this respect, as Mr. Groves remarks, London compares favourably with some large towns which are supplied with what is usually called "pure water" derived from lakes and springs. On another point affecting the Metropolitan Water Question, some very useful facts were laid before the Commission by Mr. J. Francis, the Engineer to the New River Company, showing the impracticability of partitioning the Company's district at the boundaries of the counties of London, Middlesex, and Hertford. Mr. Francis further explained

that it would be impossible to apportion the existing works according to the proposal of the County Council in their Bill, under which the Council of each district might acquire the sources, together with the works of supply and distribution, within its own area. This is one of the questions specially remitted to the Royal Commission, and one of peculiar importance if the supply is to be transferred from the Companies to a public body, or to more than one body. Another incident consisted in the statement made by Mr. H. C. Bowles, the Governor of the New River Company, that prior to 1852 the Company were not restricted as to charge, nor were they under compulsion to afford supply. With compulsion came a statutory scale of charges. It was the desire of the Company to preserve the most friendly relations with the consumers. In the City, owing to the great rise in the rateable value of property, the Company had hitherto abstained from claiming the full water-rates to which they were entitled. Should the undertaking be purchased, the result would be specially injurious to the City, where full rates would then be imposed. With such a prospect, will the Corporation help the County Council to get their Purchase Bill passed?

The County Council appear to have been in too great a hurry with their Welsh Reservoirs Bill to pay due attention to the requirements of Standing Orders. There have been various blunders with respect to the giving of notice to parties whose property is to be acquired, as also in describing the property concerned. No doubt it is difficult to avoid errors and oversights, as when five John Joneses have to be separately identified. But the maze of irregularities is remarkable, and must sorely have taxed the patience and acumen of the Examiner. The London Water Companies have been blamed for having—it is alleged—induced a large number of persons to come up to London from Wales so as to object before the Examiner to the notices, on the ground of petty misdescription. But to this it is replied that the Companies will probably have no other opportunity for contesting the Welsh Reservoirs Bill; the County Council having made this a separate measure, in the hope of proving that, as it relates only to Wales, the Water Companies and ratepayers of London have no *locus standi* against it. This is ingenious, and so also is the stratagem—if it be really such—by which the Aqueducts Bill is published without so much as an attempt to comply with Standing Orders. "One who Knows" writes to "The Times" to boldly declare that the Aqueducts Bill "is practically a sham." Why it should be so is not quite clear; and on this point, if there is "One who Knows," there are many who do not know. The Council can hardly intend the Aqueducts Bill to be a nullity for the present year. The time is long past when they ought to have deposited their plans and books of reference in respect to this measure; but they contemplated this failure, and gave official notice that in due time they would apply for a suspension of Standing Orders, so that the Bill might proceed. But while behind time in detail, the County Council may find that they are even before the time with their Welsh scheme. "A London Ratepayer" in "The Times" of yesterday, denies that the Welsh Reservoirs Bill is intended to shut out the opposition of the Water Companies, and says that no such idea was ever entertained by the County Council. Perhaps it is sufficient to say that the Companies might be very naturally suspicious as to he designs of the Council in the peculiar severance of the Welsh project.

Reports of Gas Associations for 1898.—By an announcement which appears elsewhere, it will be seen that the above-named work is ready. As this is the sixteenth year of publication, the general character of the book does not call for special notice. It presents in a convenient form for reference a record of the year's work of the Provincial Associations, and is thus a companion volume to those issued by the two London Institutes.

Twelve Retorts in an Oven.—Mr. W. Foulis has started on a new course in building his retorts at the Dawsholm Gas-Works. As the retorts require to be renewed, he has adopted the system of putting in twelve where eight were in use before. He has twelve ovens so equipped; and, of course, they are all worked by gaseous fuel.

Synthesis of Phenol by Acetylene.—According to the "Comptes Rendus," M. Berthelot has effected many syntheses by means of acetylene; one of the most interesting of them being that of phenol, which is obtained either through the condensation of acetylene in benzene, or by the action of potash on a sulphonated derivative of acetylene. In both cases the synthesis only requires a temperature of about 200°.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 260.)

It really looked last week as if the long-expected good time for the Stock Exchange was coming at last. Business was quite active in pretty well every department; and in some the volume of transactions reached a point which had not been attained for months. Of course, the tendency was good all round (Consols only excepted, and they were weaker); and prices had a nice, but not a phenomenal, advance. The settlement was a large affair, but free from complications. The demand for short loans which it involved found its response in the Money Market, which was fully equal to all requirements. Discount rates were steady. The Gas Market was fairly active on the whole; but the volume of business was not evenly maintained day by day, and a busy time was followed by a lull. Quotations were not uniformly higher throughout. But the general tendency was favourable; and there are many more advances than retrogressions. In Gaslights, the ordinary opened unchanged, but soon experienced a check, which threw it back a point. However, it then stood firm, and closed steady at 120, or a little better. The maximum and the preference were also moderately dealt in at improving figures; and they each advanced a point. South Metropolitan was very quiet; and though the price was put up a couple of points, it did not tempt stock into the market. Commercials again were quiet and unchanged. The Suburban and Provincial group were absolutely stagnant, without doing any business at all; but one or two changes in price were made. Crystal Palace was advanced, while Newcastle debenture was put on a lower footing. Rather more activity was perceptible among the Continental Companies. Imperial changed hands daily at good steady figures; Union did much the same in a more moderate degree; and European was quiet but firmer. Several undertakings in remoter parts did well; Hong Kong, Monte Video, and River Plate being noticeable for better figures. The Water Market was more animated than usual; there being some brisk buying of Southwark at well-advanced prices. The tendency was good all round; and several other water issues also improved.

The daily operations were: Business in Gas opened well on Monday, and marked prices were good, but quotations did not move. In Water, East London improved 1. On Tuesday, transactions in Gas were rather more limited, and movements were irregular. South Metropolitan and River Plate debenture rose 1 each; but Gaslight ordinary fell 1. Southwark Water rose 2. Wednesday brought a little more activity into the Gas Market, coupled with improved prices. Imperial advanced 2, Gaslight maximum and preference 1 each, and Hong Kong ½. In Water, Southwark ordinary and ditto "D" rose 3 each. Business was maintained at the same level on Thursday; and prices kept well up. Monte Video rose ½. Things began to be a little quieter on Friday; but prices were steady. South Metropolitan rose 1, and Crystal Palace 2; but Newcastle debenture fell 5. In Water, Grand Junction, Southwark, and West Middlesex rose 2 each. Saturday was quiet. River Plate rose ¼.

ELECTRIC LIGHTING MEMORANDA.

The Issue between Municipalized and Free Electricity—The Question of Monopoly—The Prospect before Electricians—A Lesson from Manchester.

The battle is fairly set between the municipalizers and the free traders in mercantile electricity. It is a plain, distinct issue which will have to be fought out in Parliament and at the bar of public opinion. The question is: Shall electricity supply from public stations be a monopoly of local authorities, or shall it be left an open enterprise for local authorities or other undertakers to engage in under commercial conditions? It is, of course, quite understood that unregulated, unlimited competition in public electricity supply is impossible. The business, by whomsoever carried on, is by common consent classed among those in regard to which the checks of common competitive trading must, in the public interest, be displaced by statutory prescriptions having the same economical object, but operating in a different way. In this limited and strictly guarded sense, therefore, public electricity supply—like the supply of gas, water, and the provisions of a postal service—is and must be a monopoly. It is necessary, however, to clearly understand the meaning of this much-abused term in this connection. Political and economical history has many records of the misuses of monopoly; and our modern Progressive politicians, with that charming partiality which is so indispensable a support for their "platform," try to give the word only a bad meaning when private adventurers are concerned. Let it be accepted, however, that the primary object of a monopoly in trade may be either that of benefiting the holder of the exclusive right or his customers. In the case of the statutory monopolies above mentioned, they are justified on the latter ground. If one could find another word to designate those monopolies which are demonstrably to the public advantage (and so distinguish them from the other order of monopoly which was essentially against public policy), it would

be desirable to use it. The name is a good deal in these matters. For there is a class of politicians, both national and municipal, which cannot get on without using "nicknames" for their opponents, in place of arguments. These persons are not, as a rule, of the highest order of intellect or standing; and their newspapers are like unto them. But both the politicians and their newspapers are "dab hands" at labelling themselves and those who happen to differ from them. They style themselves the Party of Progress, and think this equivalent to canonization. Everything they want to do is an "advance;" their opponents or critics—it is all the same—are "reactionaries," "monopolists," even "traitors" to the cause of Municipalism.

Not that the Party of Progress has any objection to the idea of a monopoly in trading. On the contrary, they want all their municipal dealings to be monopolistic in the highest degree—just as they claim for themselves personally the monopoly of public spirit, wisdom, and even common honesty in the conduct of public affairs. It is not the monopoly they object to, but the hands (other than their own) in which it may happen to rest. Your municipal Progressive wants all monopolies for the municipality, and all municipal enterprises to be monopolies. This is the measure of his notions on the subject. So far the desire is a natural one, if one-sided. But the latest developments of Progressive ideas in Municipalism indicate that the original sanction of monopoly in trading—the subserving of the public advantage—is passing out of view from the Progressive standpoint. Upon this original ground, the monopoly might be broken into at any time if this course were demonstrably expedient in the public interest. Now, however, the claim is advanced that when once a supply or a service is municipalized, the monopoly must be maintained intact, altogether irrespective of the prospect of a better supply or a cheaper service being offered by another undertaking.

This is the claim which the greater electrical interest, which is independent of municipal patronage, has set itself to repel. It is only the electrical interest at present that can hopefully resist the pretensions of Progressive Municipalism. Water supply—once a matter for private enterprise everywhere—has, by common consent, been relegated in principle to the care of local authorities. There is no question of manufacture, and but little of commercial concern in a water supply undertaking. Gas supply is different; and though the actual commodity of gas is never likely to be greatly altered or superseded—which is the chief reason for municipalizing the "monopoly"—it is by no means established that the process of municipalization, so far as it has gone, has benefited the public or the industry. Electricity is still more different, so to speak; and the prospect of handing it over exclusively to local authorities to deal in is one that those who entertain the highest hopes of its possibilities shrink from. They want to keep a little bit of Progressivism for their own science and industrial interest, and certainly do not want to be tightly bound hand and foot by the municipalities of the country.

A striking example of what municipal monopoly may mean in respect of electrical tramway working is supplied by the new development of municipal tramway administration in the Manchester district. Here all the tramways running over and through many populous places are practically one. Manchester itself has always had its own tramways; but the working has been leased to a Company whose term expires in a couple of years. About the same period, the adjoining lines running through a big ring of towns will become public property; and the opportunity may be taken for consolidating a huge tramway system which could reach from Liverpool on the one side to Halifax on the other. This is a very natural arrangement in the circumstances. The Manchester Corporation have a great tramway property of their own; they may lease other lines, and nobody can set a limit to this enterprise. Eventually, the Manchester Corporation may need a "pit-head" electricity generating station to supply the energy necessary for enabling the whole population of South Lancashire to travel about the neighbourhood. Obviously, if all this dream of progress were realized, other electrical interests would not have a "look in" upon the Manchester Corporation preserves. The Corporation might manufacture and supply everything needed for their tramway and electrical service generally, and so set the time of day for electrical science and technics over a huge and busy region. The picture is not an attractive one to independent electricians; but it lies actually stretched out before them.

The Evolution of the Blast-Furnace.—A paper bearing this title was recently read by Professor A. Humboldt Sexton before the Philosophical Society of Glasgow. In the course of his remarks, the Professor said the first blast-furnaces in Scotland were erected in Ross-shire in 1607. Later, there were furnaces on Loch Fyne and at Bunawe on Loch Etive. The consumption of charcoal was so great that it looked as if the process would have to be abandoned; but in 1665 Dudley suggested the use of coal. It was, however, not until 1773 that Abraham Darby made this a success at Coalbrookdale. The first coke-furnaces were erected at Carron about 1760. In 1786 the Clyde Works were established, and there, in 1801, David Mushet discovered the black-band ironstone. In 1828, Neilson applied the hot-blast, which might be taken as the commencement of modern iron-smelting.

THE DESIGN OF THE NEW GRANTON GAS-WORKS OF THE EDINBURGH AND LEITH GAS COMMISSIONERS.

In the last number of the "Journal" we were able, through the courtesy of Mr. W. R. Herring, the Chief Engineer and Manager of the gas estate of the Edinburgh and Leith Corporations, to publish in full his summarized report upon the sectional reports of the Commissioners who were deputed to accumulate information to serve as the basis for the design of the proposed new gas-works at Granton. It is impossible to overrate the technical interest and importance of this communication. To few gas engineers has such an opportunity as that offered to Mr. Herring in this connection presented itself in any generation; and it is with sincerest pleasure, and without any reserve, that we are now able to compliment Mr. Herring upon the way in which he has risen to the occasion. The Edinburgh and Leith Corporations Gas Commissioners, and through them the owners and ratepayers and gas consumers of their district, are to be congratulated upon the prospect opened out by Mr. Herring's report, that the necessities of the local gas situation will be met in the best manner known to contemporary science. We have no hesitation in ascribing the very highest quality of judgment to Mr. Herring's criticism of existing gas-works design, construction, and working at home and abroad; and we consider that his block plan for the proposed Granton works is excellent in every important respect.

These due acknowledgments being paid, let us discuss the report and its chief conclusions upon the merits. There is no exact precedent for the manner in which the Edinburgh and Leith Gas Commissioners set about the responsible task of providing themselves with a new gas-works to take the place of the condemned old intramural station. The last establishment of the kind to be laid down in this country was the East Greenwich works of the South Metropolitan Gas Company. This works was designed by Mr. George Livesey, assisted by Mr. Frank Livesey and the late Mr. John Somerville. In the design, the side-by-side principle of placing the carbonizing units was adopted, in contradistinction to the "end-on" principle observed at Beckton—the only other comparable establishment. Between the date of Beckton and that of East Greenwich intervened Redheugh, the new manufacturing station of the Newcastle and Gateshead Company, designed by Mr. V. Wyatt; and the Bradford Road station of the Manchester Corporation, the design of which was made the subject of open competition. Meanwhile, Glasgow, Liverpool, and Birmingham have been equipped with more or less new gas-works upon the largest scale. Abroad, big gas-works have been built of late years in New York, Amsterdam, and Vienna. Hence there has been no lack of examples for the study of the Edinburgh and Leith Commissioners, who naturally wished to satisfy themselves as to the manner in which other gas undertakers had dealt with the problems of works extension and improvement. In the case of such a body as the Edinburgh and Leith Gas Commission, there is probably the nearest approximation to the ideal organization for gas supply administration. Given two essential factors—commissioners worthy of their town and devoted to duty, and a professional adviser of competent ability and "class"—a Scottish Gas Commission should be hard to beat in competency for the work committed to their care. They start with the inestimable advantage of having no divided aims. They need not keep one face for the ratepayers and another for the gas consumers. With this singleness of purpose—the selling of the cheapest and best gas—and with complete detachment from "political" objects, a Scottish Gas Commission ought to be able to serve their public better than any ordinary Board of Directors or time-serving Corporation Gas Committee on the English model. At any rate, from the numerous good business and scientific men whom one might expect to find upon such a Commission as we have indicated, a sufficiency of competent critics of gas-works design should be available for such deputations as those sent out from Edinburgh last year. The difficulty of this kind of criticism lies in properly distinguishing between the essential and the accidental. The influence of date, the effect of personality, the pressure of local and special conditions, must all be allowed for in judging of a particular gas-works. If one may form an opinion from the voluminousness of their sectional reports, the Edinburgh and Leith Commissioners took a very serious view of their duty. There was only one thing to be done with the mass of facts they collected—to consign them to the Chief Engineer for him to extract the truth and embody the fruits of all their observation and knowledge in a definite plan.

We do not know what is in these sectional reports; but whether Mr. Herring owes much or little to them, we do not think it possible to draw a better set of inferences as to what should be done at Granton than those so simply and intelligibly stated in his report, and expressed in his block plan for the new works. The first consideration he mentions is that of space—room, light, and air in gas-works. Unquestionably, every word he says on this head is justified, particularly in regard to the alleged noxiousness of gas manufacturing operations. This is a grave consideration in his case, and should be everywhere. Let a gas-works be never so cleanly kept, there must be a certain disengagement of sulphuretted hydrogen gas through the quenching of the coke, and the working of the water ash-pans. Where the retort-houses

are given air and space, however, this passes off insensibly by the only possible natural process—diffusion in the atmosphere. It is unnecessary to labour this point. With regard to the chief points of the general arrangement of the works, Mr. Herring, having begun right with the adoption of the side-by-side carbonizing units, could hardly have gone wrong in other respects. He has been guided by the safe rule of dealing with gas manufacture as chiefly a question of the shifting of heavy and bulky material in enormous quantities. There is a general similarity between the disposition of his plant and that shown at East Greenwich. He has an advantage in the matter of easy connection with existing railway lines. This is how he proposes to get the most of his material and products into and out of the works. It is a railway-traffic station; the harbour facilities being treated only as a possible alternative.

With regard to the type of carbonizing plant selected, we rejoice that Mr. Herring has had the courage of his opinions, and has pronounced unequivocally for inclined retorts, 20 feet long, with the angle determined rather by consideration of the requirements of good charging than of "automatic" discharging. There is nothing in the whole report that becomes him so well as his masterly treatment of this question. The circumstance that Mr. Herring thus independently confirms the position that has been consistently maintained in the "JOURNAL" with regard to the choice of carbonizing plant, is, of course, gratifying to us; and we might therefore naturally be expected to applaud his selection. The fact of our having believed in the inclined retort all along, however, through good and evil report, is not going to deprive us of the pleasure of recognizing this triumph of the system—for such it assuredly is. Mr. Herring's considered judgment on this matter should be read in conjunction with the discussion of the subject at the meeting of the Institution of Gas Engineers last June, when he was not quite sure whether to go in for 15 or 20 feet retorts at Granton. He has now made up his mind for the longer retorts, and cast his vote in favour of looking to the angle of inclination for ensuring successful charging and the retention of the charge in its proper place. It would be impertinent to paraphrase the statements of the report in this regard; and it only remains to say that Mr. Herring has, in our opinion, gripped the rights of it.

Mr. Herring's criticism of the mechanical handling of gas-works materials and products is thoroughly competent. He shows how much work of the kind there is to be done, and maps out the margins subsisting between hand labour charges and the working costs of the machinery that might be used in substitution therefor. This is the right way to state such questions. With regard to the semi-chemical subjects of gas condensation, washing, and purification, the report is on the correct lines. The use of water for condensing, and the application of the principle of tar extraction by "shock," are proper for works on the scale of Granton. In respect of purification, Mr. Herring appears to contemplate the necessity for the removal of sulphur compounds from his Granton gas. Now, it used to be said that these compounds did not exist in Scotch gas. This was at a time when the gas in question was made wholly from cannel, and had a nominal illuminating power of probably 35 candles. This is Mr. Herring's estimate. The general belief is that Edinburgh gas was supposed to be of about 28-candle power. The uneconomical character of this over-rich gas has been found out, however; and there has been a general reduction of the illuminating power of Scottish gas. Glasgow has come down to 21 candles; but Edinburgh claims 24 to 26 candles in the last Board of Trade returns. Is Granton going to turn out a cheaper article, and attend to sulphur purification? It would seem likely. It is worthy of notice that Mr. Herring thinks it will be of advantage to grind spent lime for agricultural purposes. His remarks about purifier-houses are just. He evidently means to make a bit of a speciality out of his lime-purifying arrangements. He does not mention the use of oxygen or air in purification. Cyanogen and sulphur recovery plant are favoured, as are also rather more complete ammonia works than usual; but tar distillation is to be left alone for the present.

Altogether, Mr. Herring's programme for Granton is a sound and safe one, pretty much upon familiar lines. We shall not for the present discuss the concluding part of the report, in which the question of public lighting is dealt with. This may well form the subject of another notice. The bulk of the report is concerned with the character of the proposed Granton Gas-Works; and it is on this account that it will be most studied. As a description of a plain gas-works, with no technical "sports" about it, the report, as we have already conceded, is creditable to all concerned. We cannot quite follow out the scheme of railways for the supply of coal into store and to the retort-houses, nor the subsequent transference of the material from store to retort-hopper. The yard space seems to be a good bit cut up by these railways, which must interfere with coke storage, as they are all on the ground level where they are not below it. The most noticeable departure from modern practice in this plan is the absence of carburetted water-gas plant. What ails Mr. Herring at this kind of gas? Is there to be no oil gas of any sort at Granton? Doubtless there is good reason for the omission of any reference to carburetting requirements from the report and plan; but the fact is noteworthy. It would be a convenience to many if a scale model of the works were made showing all the roadways, railways, hoists, and gas-connections as they are intended to be.

GAS—THE HATED RIVAL.

A VERY significant feature of much present-day literature of the lighting industries is the common cause made against gas by many of those whose business it is to exploit rival illuminants. Electricians do not labour to convince the public that electric lighting has advantages over lighting by mineral oil lamps; neither do the manufacturers of acetylene plant display unseemly zeal in belittling illumination by electricity. But both electrical and acetylene technicians combine to discredit gas, by fair means or foul—and if the truth be confessed the methods employed are at times unspeakably foul. Probably the attitude of unreasoning hate adopted by the exponents of these "lights of the future" towards illuminating gas, is the outcome of a very real dread that in the ultimate struggle for survival their *protégés* will be worsted by their centenarian rival, whose metabolic activity still shows that growth which ceases when the prime of life is past. The vigorous mineral oil industry stands on a less firm basis than the gas industry, because the centralization of population which is proceeding gradually in every progressive country favours the economical distribution of gas, and is disadvantageous to oil. It is not, however, from the "Oil Kings" that the underhand attacks on illuminating gas emanate. The worst offenders of the present day are to be found in the ranks of the vendors of acetylene plant, whose attitude is the more incomprehensible because every rational objection to coal gas may be applied with equal or greater force to acetylene. The gas industry, indeed, is too well established, and too well controlled, to suffer harm from such puerile onslaughts. Yet even the inventive geniuses who have flooded the Patent Offices with acetylene schemes recognize that "gas" is a name with which they may curry favour with the public; and they affix the word to acetylene with a persistency and an unanimity which are little short of marvellous. It is acetylene "gas" they propose to generate, or purify, or utilize, as though it were a "gas" produced from acetylene—even as coal gas and oil gas are produced from coal and oil—with which they were dealing. Perhaps it is merely an instance of the contagiousness of loose diction, and that by "acetylene gas" is meant "gaseous acetylene;" though it is hard to believe that the majority of the inventors ever handled, or supposed that the royalty-paying public would handle, acetylene in either the liquid or solid state. We prefer to credit those responsible for the barbarism with a laudable desire to trade on the reputation of "gas," which, in the language of ordinary life, implies common illuminating gas. Yet, if intelligence carries them so far, it is difficult to understand why they forthwith proceed to revile this same commodity!

It has been our unpleasant duty frequently to refer to the exaggerated claims made on behalf of acetylene as an illuminant. Some statements have recently been brought to our notice which are perhaps even more reprehensible than many of those circulated by stallholders at the Acetylene Exhibition at the Imperial Institute last summer. They are unfortunately being scattered broadcast through the country, in circulars issued by makers of acetylene appliances. In so far as invidious comparisons are made with coal gas, we must take leave to point out some of the most flagrant "errors"—if the euphemism be not inadmissible. A charge of 2 lbs. of carbide, which yields at the most 10 cubic feet of acetylene, is said to afford for five hours approximately the same light as three "C" Welsbach incandescent burners. Now the "C" Welsbach burner gives an average light of 50-candle power; and consequently we gather from the above statement that 10 cubic feet of acetylene furnishes a light of 150 candles for five hours. In other words, the illuminating power of acetylene is made out to be 375 candles, which is about *three times* as great as its actual illuminating power in burners such as are practically available for general use. Another of the statements in the same circular is: "Light for light, the acetylene gas is about equal in cost to coal gas at 2s. 6d. per 1000." Let us credit acetylene with the rather high practical illuminating power of 150 candles, or with a lighting duty of 30 candles per cubic foot. Ten cheap flat-flame coal-gas burners would give 150 candles for a total consumption of 50 cubic feet per hour. The consumption of acetylene under such conditions would, light for light, be one-tenth that of coal gas. If coal gas cost 2s. 6d., acetylene may cost 25s. per 1000 cubic feet, and compete with it. In order to obtain acetylene at this price, carbide must be procurable at 1½d. per pound. It is not obtainable in moderately small quantities at double this price! Let us for a moment turn the tables, and give coal gas the benefit of the duty of 30 candles per cubic foot which the new Welsbach burner affords. Then, to be on terms of equality, acetylene must be obtainable at the same price per 1000 cubic feet as coal gas; or carbide must be bought at 0·15d. per pound, or £1 8s. 0d. per ton. This is about one-third of the freight charges alone on carbide from Foyers to London!

Acetylene has its sphere as an illuminant; but it most certainly is not that of a competitor with coal gas, wherever the latter is obtainable at 10s. per 1000 cubic feet or less. The sooner the makers of acetylene generators recognize this fact, the better for their business. The public, once deceived by specious promises of performances which acetylene cannot carry out, will not forget that its confidence has been abused. But let the case for acetylene be fairly stated, and a very legitimate and permanent business in generators and carbide should result.

Dr. Frank, the well-known Charlottenburg gas expert, has lately expressed the opinion that though acetylene cannot compete with coal gas or water gas as an illuminant, it should in Germany replace petroleum, if carbide is obtainable in sufficient quantity at the rate of 7½ lbs. for 1s., and if a practicable portable acetylene lamp is made. This seems quite as sanguine a view of the prospects before acetylene in Germany as one dare take; and the scope is less in this country, where oil and gas are very much cheaper. In fact, the recent utterances of Chief-Lieutenant Kries, of the German army, in an address on the German Colonies, must be poor consolation for those who have put faith in the future of acetylene. The gallant officer suggested that manufacturers of carbide and of acetylene plant should turn their attention to the German Colonies, of which only Kiowchow has coal deposits. The East African and other colonies have to import fuel and illuminants; and since the freight on carbide would be less than on the quantity of coal which would give an equivalent amount of illuminating gas, carbide should be able to find a market in these coal-bereft regions—always provided that they have not water power handy for the production of electric light. If the districts in which acetylene can compete with coal gas are fairly represented by the colonial possessions of Germany, there does not seem much fear of a general decline in the gas industry from the severity of acetylene competition. Manufacturers of acetylene generators should spare themselves the trouble of inveighing against coal gas as a hated rival, and turn their attention to the minor fields of application of acetylene, in which it need not fear coal gas as a competitor.

THE INCLINED RETORT PATENT.

After an uphill struggle with adverse circumstances, and just as the prospect is beginning to brighten, the Automatic Coal-Gas Retort Company, Limited, have reached the crisis of their existence. The original patent of M. Coze (which the Company own) for "Automatically Charging and Drawing Retorts" was dated June 20, 1885; and consequently the life of the patent—fourteen years—is drawing to a close; but considering they have good cause for claiming a continuance of the enjoyment of the monopoly and rights in the invention, the Company are taking the necessary steps for securing it. It is not intended—nor is this the time, as the matter is *sub judice*—to discuss the equity of the Company's title to consideration in respect of the privilege which they desire; but there are two or three points of interest to which attention may be drawn at this stage.

As already mentioned, Coze's original invention was patented in this country on June 20, 1885; but it was not until nearly five years later that the Coze Syndicate, Limited, was registered. The existence of the Syndicate was of short duration; for five months afterwards the present Company was formed, having for its main object the acquisition of "the monopoly and rights for the United Kingdom in respect of certain inventions for improvements in apparatus for charging and discharging gas-retorts on the system devised and patented by M. Coze, with improvements by Messrs. Morris and Van Vestrant." The history of the Company is so well known that it would be superfluous to relate it here; but the eight-and-a-half years since its formation have been a period of much hard work and anxiety for the Directors and officials, with disappointing financial results. Slowly but surely, however, the inclined retort system has established for itself a strong position as one of the most advanced, scientific, and labour-saving methods of coal carbonization; but, unfortunately for the Company, it has only been in the latter years of the ordinary protected duration of an invention that its several good qualities have begun to be generally recognized among gas engineers. Many reasons might be given for this tardiness; but it would serve no beneficial end to dwell upon them.

The Company were consequently advised to petition the Privy Council for a prolongation of the patent; and the time for lodging caveats in opposition has now expired. The opponents to the application were few in number, but strong in position. There were originally five; among them being, we understand, The Gaslight and Coke Company and the Gas Companies' Protection Association. Two of the others have withdrawn within the past few days; and there is a probability that the third will follow the same course—leaving only the two bodies named to represent the opposition. The usual procedure, on caveats being lodged in opposition to a petition of this kind, is for the Solicitors to the applicants to serve the opponents with a copy of the petition of their clients; and within twenty-one days from the receipt of the petition, the opponents must submit a statement of their grounds of opposition. In this instance, the three weeks are about at an end; so that the Company now know, or will do so in a few days, the exact nature of the case they will have to meet. The Company have already applied for a time to be fixed for the hearing of the case in support of the petition; but it is hardly likely that it will take place this side of Easter.

It may not be generally known that, after the litigation with the Salford Corporation, the royalty charged by the Company was substantially reduced; and, considering the importance of the invention, the amount which has to be paid now is regarded by many engineers as a modest one. The royalty on an installation is met by one final payment; but the Burnley Corporation hold the distinction of being the only body paying an annual sum. We have referred to the brighter prospect lying before the Company if they can secure a prolongation of the patent; and the amount of work about to be taken in hand, and the inquiries which are being made, are evidence that the Company would, by a continuance of their monopoly and rights, reap advantages which have been denied them in the past. At the Cambridge Gas-Works, an installation has been completed recently, and work is in progress, or will shortly be, at Wolverhampton, Smethwick, Rotherham, Radcliffe, and Brighouse. Birmingham, too, will soon be making a move with the large house at Saltley; and there is the prospect of a considerable amount of work being provided by Edinburgh. There may be other towns which should be included in this list; but those which have been named go to prove that the merits of the system are becoming more widely appreciated.

GAS BILLS FOR THE SESSION 1899.

(*Continued from p.* 176.)

The Dublin Corporation Bill does not contain any clauses specifically relating to gas supply; but it proposes to dissolve a number of Urban District Councils, and transfer all their property, debts, and contracts to the Corporation. Disestablished officials are to be compensated. The Corporation are to be the Sanitary Authority for the extended district. As soon as convenient after the passing of the Act, the rateable hereditaments in the City are to be revalued.

The Dundee Gas, Tramways, and Extension Bill is to authorize the Dundee Gas Commissioners to acquire additional lands and enlarge their works. The sum of £50,000 is required for gas-works purposes, in addition to the loan facilities conferred by the Corporation Act of 1897. The gas revenue is to be applied wholly to capital and working charges and expenses, according to the judgment of the Commissioners. The new loan is to be extinguished by a sinking fund of 1½ per cent. One-third of the cost of the Act is to be borne by the Gas Commissioners.

The Glasgow Corporation (Gas and Water) Bill is to confer powers for the acquisition of 121 acres of land for a new and additional gas-works. Certain roads and railways are also to be constructed; and a private road is to be stopped up. Agreements are to be entered into with the Caledonian and North British Railways. Permission is sought for the discontinuance of the Dalmarnock gas-works. A clause dealing with the period of error in defective meters proposes that the incorrect registration shall be deemed to have first arisen at the beginning of the then last-rendered account for gas consumed, unless it be proved to have occurred subsequently. Power of inspection is desired for pipes in new buildings. Tenants are to be held liable for sub-tenants' gas bills up to six months. Prepayment may be demanded for gas supplies of less than three months. Gas loans are to be made applicable to the acquisition of adjacent electrical undertakings.

The Loughborough Corporation Bill contains a part relating to gas. It is proposed to acquire the undertaking of the Loughborough Gas Company; compensating officers and servants injuriously affected by the transfer. The gas limits are defined. Power of inspection of fittings in new buildings is desired; and also the right to prescribe the size and quality of fittings by a bye-law. Gas of 15-candle power is to be supplied, at the maximum price of 3s. 6d. per 1000 cubic feet within the borough and 4s. beyond. Prepayment may be asked for supplies of less than six months. Surplus gas profits are to go to the district fund. A gas-works improvement loan of £40,000 is required, with £10,000 as working capital. The former capital is to be repaid in 45 years, the latter in 20 years. Discounts to gas consumers may be given for prompt payment or large consumption; notice being published on the demand notes. Additional gas lands to the extent of 5 acres may be acquired.

The Manchester Corporation (General Powers) Bill has a clause enabling the Corporation to light private streets and blind alleys. Permission is sought for the establishment of a Corporation fire insurance fund amounting to £50,000. Power is desired to raise £250,000 of authorized loan money by the issue of Corporation Bills or promissory notes. For certain purposes in connection with this project, "the Corporation, the Town Clerk, and the Treasurer" are to be deemed a "banker." It is proposed to purchase and extinguish the irredeemable stock of the Corporation by reborrowing.

The Perth Water, Police, and Gas Bill contains a clause amending the Act of 1897 by substituting £75,000 for the £50,000 authorized to be borrowed for gas purposes. One-sixth of the cost of the Act is to be paid by the Gas Commissioners.

The Warrington Corporation Bill contains a clause authorizing the Corporation to make bye-laws respecting gas services and fittings. The Corporation seek to establish a thrift fund, to which the employees and the Corporation would contribute equally.

We may note that several Corporation Bills embody what are tantamount to Tramway Orders and Electricity Supply Orders. We do not propose to take special notice here of these proposals when they are independent of the gas capital or administration of the local authorities.

WATER BILLS FOR THE SESSION 1899.

The following Bills now in Parliament relate wholly or in part to water supply undertakings.

The Barton-on-Sea Water Bill proposes to incorporate a Company for the supply of water to a district on the coast of Hampshire, including the borough of Lymington, subject to the consent of the Corporation. The supply is to be made effective within five years. The capital of the Company is to be £40,000, with the usual one-fourth proportion of loan capital. Sir R. Affleck, Bart., and two of his nominees are to be the first Directors. The source of supply is to be by pumping from a well in the parish of Milton. The works are to be completed in five years. The charge for domestic supplies is to be the uniform rate of 7½ per cent., with 9 per cent. for inns and schools. The maximum price of water supplied by meter is put at 2s. per 1000 gallons. Water for public sanitary purposes is to be supplied on demand at 1s. 6d. per 1000 gallons.

The Church Stretton Water Bill is to incorporate a Company with a share capital of £30,000 and the usual borrowing powers, for supplying the parish of Church Stretton, in Shropshire. The source of supply is to be by impounding the waters of the Carding Mill Stream, subject to providing compensation water at the rate of 62,500 gallons per day. Power is desired to agree with owners and occupiers as to the drainage of gathering grounds. The works are to be completed within ten years. Rates for domestic supplies are to range from 9 to 7 per cent., with the higher charge for inns. Owners paying for three or more houses are to have a rebate of 20 per cent. The price of water supplied for any purpose by meter is to be 1s. 6d. per 1000 gallons. The supply is to be made effective within five years.

The Fishguard Water and Gas Bill relates in part to the incorporation of a Company to supply water in the Pembrokeshire parishes of Fishguard, Manorowen, and Llanwnda. The works are to comprise an impounding reservoir in the parish of Llanllawer; no name being given to the stream. The scheme is to be completed within five years. Rates for domestic supplies are to range from 10 to 6 per cent. Inns are to pay 9 per cent. Owners compounding are to receive an abatement of 10 per cent. The whole share capital of the Company is to be £16,000.

The Menstone Water-Works Bill is to incorporate a Company started in 1874 with a share capital of £2900 for supplying water to Menstone, in the West Riding. The capital is to be increased to £12,000, part of which is to be the original capital converted into stock. The loan capital is to be one-third of the share issue. An additional reservoir is to be constructed in the township of Menstone. The land is to be acquired within five years, and the reservoir completed in seven years. Rates for domestic supplies are to range from 8 to 6 per cent. The price of water sold by meter is to be 1s. 6d. per 1000 gallons.

The Nene Valley Water-Works Bill is to incorporate a Company for the supply of a number of places and parishes, including the borough of Higham Ferrers, Northamptonshire. The supply is to be made effective in from two to five years. The Local Authorities may jointly within two years after the completion of the works require the Company to sell at a price which is not to be less than the capital reasonably expended by them. The capital of the Company is to be £64,000, with the usual borrowing powers. The works are to comprise a well and pumping-station in the parish of Little Addington, and a service reservoir in the parish of Finedon, to be completed within six years. Rates for domestic supplies are to range from 8 to 6 per cent. The maximum price of water supplied by meter is to be 1s. 6d. per 1000 gallons. After the expiration of five years, the Company are to be bound to lay down pipes where required by any of the Local Authorities interested; completing the work within one year. If the Company think fit, they may in this event require a fifteen years' guarantee of such consumption as will, at the normal rates, provide them with 10 per cent. interest on the cost of mainlaying. Water for public sanitary purposes is to be supplied at 9d. per 1000 gallons.

The St. David's Water and Gas Bill is to sanction the statutory supply of water in the city of St. David's. The supply is to be made effective within five years. The source is to be a well at a place called Nine Wells, in the parish of St. David's. Rates for domestic supplies are to range from 10 to 6 per cent., with 9 per cent. for inns.

The Totland Water-Works Bill is to incorporate with statutory powers a Company formed in 1883 to supply water in the Isle of Wight. The present share capital consists of £4000; and there is a debenture loan of £400. The district supplied was formerly part of the parish of Freshwater, over the whole of which the Freshwater and Yarmouth Water Company obtained powers of supply by an Order of 1887. It is alleged that the Yarmouth Company have never exercised these powers of supply with regard to Totland, and that they are willing that such portion of their powers should be extinguished. This is consequently to be done, in the interest of the Totland Company, who are to make their supply effective within five years. The capital of the Company is to be £10,000, whereof £3140 is the original capital. The usual borrowing powers are desired. The works comprise some tanks situated in the parish of Freshwater, connected with a spring belonging to the Company, to which is to be added a service reservoir on Headon Hill, in the parish of Totland. Rates for domestic supply are from 7 to 5¼ per cent. The price of water supplied by meter is to be not more than 2s. per 1000 gallons. Mutual arrangements for the supply of water by bulk may be entered into between the Totland and Freshwater Companies.

The Highland Water Power Bill is not an ordinary Water Company's Bill. It is to sanction the providing of a water power and electrical generating station at Loch Leven, in Inverness-shire. The Earl of Crawford and Balcarres is at the head of the undertaking. Land for the power station is to be taken in the parishes of Kilmallie, Lismore, and Appin. The capital is put at £1,000,700, of which £1,000,000 is to be in "A" 6 per cent. preference shares, and the remainder in "B" shares, which are to rank equally with the former for dividend after 6 per cent. has been paid. Not less than £100,000 is to be subscribed before the powers of the Act for compulsory purchase of land are put in force. Lands and easements may be paid for in shares. The Company may finance other companies working in conjunction with them to the amount of £50,000. Borrowing powers are asked for to the extent of one-third of the actual share capital issue. The proposed works are eighteen in number, and many streams are to be impounded by them for the purposes of the Company. These streams are feeders of the Rivers Tummel and Tay. The land is to be acquired within five years, and the works completed within ten years. Interest at the rate of 3 per cent. is to be payable on capital during construction, provided that two-thirds at least of the share capital is subscribed, and that the aggregate amount so paid for interest is not more than £60,000.

PERSONAL.

Mr. W. H. Preece, C.B., F.R.S., will next month resign his position of Electrician to the Post Office.

Mr. Boverton Redwood has received from the King of the Belgians the decoration of a Chevalier of the Order of Leopold, in recognition of his services as President of the International Jury for Lighting Appliances and Materials at the Brussels Exhibition, 1897.

Mr. P. B. Watson, who recently resigned his position as Manager of the Falkirk Gas-Works, has started business in the town. He was recently met by a deputation from the employees of the gas-works, and presented with a purse of sovereigns as a mark of their respect and esteem.

Mr. J. F. Taylor, who has been a member of the Board of the York United Gas Company for 38 years, and Chairman of the Company for the past 19 years, has relinquished this position owing to failing health. He is succeeded by Mr. J. R. Hill, the Vice-Chairman; Mr. J. Melrose taking the vice-chair.

Mr. E. J. Brockway, the Engineer and Manager of the Cleethorpes Gas Company, has, in addition to his present office, been appointed to the Secretaryship, in succession to Mr. A. Bates, who died on the 19th inst. The last-named gentleman occupied the dual position of Secretary and Solicitor to the Company.

There were a large number of applicants for the appointment of Secretary and Accountant to the Aldershot Gas and Water Company, advertised in the "Journal" last month; and we learn that the choice of the Directors has fallen upon Mr. R. W. Edwards, who for the past fifteen years has been engaged in the Gas, Water, and Electrical Engineer's Department of the Wallasey District Council.

Mr. William S. Allwood has been appointed Manager of the Dunstable Gas and Water Company's works, in succession to his father, who died, after six months' illness, on Nov. 28 last, having served the Company 24 years in the capacity now occupied by his eldest son. Among his previous engagements, Mr. Allwood has been Manager of the Stony Stratford Water-Works and of some private works, and has also held an appointment under his grandfather (Mr. S. Carpenter) at the Bow Common works of The Gaslight and Coke Company. His first experiences, however, were gained, during eleven years' service with his father, on the works of which he has now been appointed the Manager.

With the view of demonstrating the regard and esteem in which the officials of the Ipswich Gas Company hold the Chairman of the Board, Mr. G. A. Biddell, they gave last Saturday evening a dinner to the Directors, the Company's staff, and representatives of the older employees, in honour of his 75th birthday, which event occurred on that day. The idea originated with the Engineer and Secretary (Mr. J. T. Jolliffe), who presided; the vice-chair being filled by Mr. F. Prentice, the Manager of the works. Mr. Jolliffe proposed the toast of the evening, and, in the name of the staff, asked Mr. Biddell's acceptance of a silver flower-bowl and aneroid barometer. Mr. D. Ford Goddard, M.P., expressed his pleasure and gratification at being present to testify to the great respect and veneration in which the Board held their Chairman. Mr. Biddell, in reply, thanked those present from the bottom of his heart for the warm sentiments expressed towards Mrs. Biddell and himself, and for the beautiful remembrances presented to him. He said he intended sticking to the Company as long as he lived. He concluded by paying a high compliment to Mr. Jolliffe's vigilance and ability; and this gentleman's health was very cordially drunk.

NOTES.

Odorizing Water Gas.

Herr Strache and others have proposed to use mercaptan or carbylamine for imparting an odour to simple water gas; but Herr Koch, in a recent number of the "Pharmaceutische Centralhalle," recommends the sulphur-aldehydes or thio-aldehydes and thio-ketones as superior for the purpose to either of the bodies named. These substances possess an exceedingly strong and persistent odour. The simple thio-acetone, CH_3 CS CH_3, would be well adapted for addition to water gas.

A Town Acetylene Supply.

The town of Oliva in West Prussia now possesses an acetylene supply, the plant for which has been constructed by a Berlin firm according to the system favoured by Dr. Wolff, which has already been described in the "JOURNAL"—Nov. 22 last, p. 1164. The installation is designed for the supply ultimately of 2000 burners. There are four generators, each capable of making 1410 cubic feet of acetylene per hour. Two of these generators are intended to be kept in reserve to meet emergencies. The gas from all the generators passes to a condenser, in which water and dust are deposited, and thence through a washer and two purifiers for the removal of ammonia, sulphuretted hydrogen, and phosphuretted hydrogen. Then, after being dried, the gas enters a holder of 1060 cubic feet capacity, which stands in the open. From the holder the gas passes through a meter, governor, and drying apparatus, to the distributing system, which commences with a main 4 inches in diameter, gradually reduced to 1¼ inches. Wrought-iron pipes, tarred, and with specially tight joints, are employed. Valves are inserted at intervals, so that the system is divided into several sections. There are 96 street-lamps, which are provided with so-called atmospheric burners. For private lighting, bifurcated burners are recommended. The domestic services resemble those for coal gas; but great care is given to their soundness. Wet meters only are used for measuring the quantities of gas consumed, as dry meters have proved unsuitable for use with acetylene.

The Problem of the Gas-Engine.

Mr. Herbert L. Towles discusses the above subject in the "American Machinist." The real problem of the gas-engine, according to this writer, and the chief reason why it does not progress faster in the direction of superseding the steam-engine, is the peculiarly delicate conditions under which the combustion takes place. It is not surprising that the equilibrium of these conditions should frequently be disturbed from causes which are not immediately apparent. "We must remember," says the author, "that the cylinder is virtually a very small firebox with water-cooled walls, that we have neither a bed of incandescent fuel, brick arch, nor length of uptake, and that our gases are lighted and must burn themselves out from two to eight or ten times a second." These are hard conditions. The one thing that renders the actual result realizable is the compression, which drives the vibrating molecules of gas and oxygen close together and preheats them before the spark or hot tube gives the quick additional impulse to their velocity which makes them meet and unite. The writer concludes that what the gas-engine needs to make it go better and farther in competition with the steam-engine is the reduction of the elements of uncertainty connected with its chemical operation. His second conclusion is that, to abolish this uncertainty, the conditions affecting combustion must be subjected to positive and automatic mechanical control, so that it shall be impossible for them to vary without actual and sensible derangement of working parts. In proportion as this is accomplished, and only so, does mechanical certainty take the place of conjecture, and reliability become a question merely of the number, intricacy, and durability of the several parts. "To achieve this then may at present be considered the chief problem of the gas-engine."

The Use of Sulphate of Ammonia for Fireproofing Timber.

It seems a "far cry" from the destruction of the Spanish fleet by the Americans at Santiago to the prospects of the sulphate of ammonia trade; but there is a real connection between the two, as appears from a recent issue of the "Engineering News." It was one of the surprises of the last naval war that much, if not most, of the damage suffered by the Spanish vessels was due to the presence in the latter of a quantity of inflammable woodwork, which took fire from the American shells. Consequently, ever since the termination of the war, the attention of naval constructors has been concentrated upon this feature of shipbuilding. It is impossible to do without wood in battleship construction; but the United States Navy Department have decided that what wood is used in their new ships shall be fireproofed. Various processes exist and are available for this purpose; but the United States Navy yard has decided upon a very simple general process resembling that of creosoting; the tar oil being replaced by a solution principally consisting of phosphate of ammonia and sulphate of ammonia. As is the case with creosoting, the principal object to be attained is to introduce the solution thoroughly into the pores and channels of the wood. In order to do this, it is necessary to first open the pores and replace the natural juices of the wood with moisture, which is afterwards evaporated off. The wood has to be carefully stewed, however, not boiled; or the pores would be sealed up, and the object in view defeated. Therefore the timbers are placed in a closed cylinder, containing a few inches of water at the bottom, and low-pressure steam is introduced. This treatment opens up the wood like a sponge, making the best possible preparation for the reception of a foreign solution. After the wood has been thoroughly saturated with moisture in this way, a vacuum is established in the cylinder, which causes the wood to empty its pores. The pumping is stopped every three hours for the liquid contents of the cylinder to be drawn off. Then the fireproofing solution is introduced under pressure; and, lastly, the saturated timber is dried. Timber so treated loses none of its strength, and will neither take nor communicate fire. Perhaps in the fulness of time fire-proofed timber will be required to be used in town buildings.

Defects of Metric Screw-Thread Systems.

From time to time the technical and commercial world is agitated by fresh demands for the adoption by the English-speaking peoples of the metric system, for the sake of uniformity with the practice of other nations. Gas engineers have their own reasons for desiring uniformity, as regards screw connections. It is rather a surprise to learn that, so far as the engineering industries are concerned, the adhesion of England to the metric system would not materially advance the cause of uniformity of screw connections, inasmuch as the European countries which have professed the metric system for many years have not yet been able to agree upon a standard metric screw-thread. Throughout Europe, there is no assurance that any metric nut will fit any bolt of the same diameter. This is not for any lack of attention to the subject; on the contrary, many such systems have been proposed, and the trouble appears to be that there are too many screw systems rather than too few. Hence, in many large Continental shops the Whitworth screw-thread is used, not only as regards pitch and form of thread, but also for the diameters of bolts; so that, while all the other dimensions of a machine may be in metric units, the bolts and nuts will be in English sizes, and conform to the Whitworth standard. The attempt to secure a standard metric screw-thread system, however, has not been abandoned; but a special effort in this direction has been put forward by a congress for the unification of screw-threads which has just been held in Zurich. The real difficulty of all metric screw-thread systems is the unsuitability of the millimetre as a unit of progression. Once again, therefore, the paper convenience of the metric system for calculations is proved to be discounted by the awkwardness of the units and their lack of correspondence with practical needs. Consequently, in all metric screw-thread systems, the symmetry and logical completeness of the metric notation, so greatly admired by our reformers, are thrown to the winds. There are sixteen such systems, all with their adherents; and to these the Zurich congress has added one more. This is practically the Société d'Encouragement thread, with the modification of advancing by half and quarter millimetres in some stages. The pure decimal system is thus abandoned. It remains to be seen whether the new system will be generally adopted. As to this, it is shrewdly remarked that it is easier to get an International Congress to adopt a new standard, than to induce manufacturers to throw away an old one.

The Local Government Annual for 1899, edited by Mr. S. Edgecumbe Rogers, again displays several new features. They include a succinct history of the Corporation of London; the latest results of the purchase of gas undertakings, and a list of those bought since 1876, with details as to receipts and expenditure; information respecting the London water supply and the Companies' capital expenditure; and a record of the efforts made in the municipalization of the water supply. The "Annual" is published at the offices of the "Local Government Journal."

Manchester and District Junior Gas Association.—The members of this Association held their monthly meeting on Saturday; the afternoon being spent in visiting the works of West's Gas Improvement Company, Limited. About twenty members were present; and they were kindly received by Mr. Fred. West (Manager) and Mr. Frank West (Works Manager), who conducted them through the works. Much interest was taken in the drawing office, where a large number of coloured drawings of works were to be seen. Passing through the pattern-shop and stores, the machine-shop was reached, where different parts of the various machines and appliances turned out by the Company were in process of manufacture. After visiting the plate-shop, smithy, and erecting-shops, in the latter of which charging-machines and coal-breakers were in course of erection, the party assembled in the offices, where light refreshments were provided. A vote of thanks was passed to Messrs. West for their invitation, and the excellent manner in which the members had been entertained. Mr. Fred. West replied, and invited them to visit the works again on some future occasion. In the evening they met at their rooms in the Manchester Technical School, to have a "Question Box" night. Among the questions sent in were: (1) "What are the advantages of regenerator settings over direct firing?" (2) "Which is the best position for the exhauster—before or after the condensers?" (3) "Can any satisfactory reason be given for the deposit of naphthalene in mains?" The questions gave rise to very good discussions, most of the members taking part therein.

TECHNICAL RECORD.

THE GASHOLDER ACCIDENT IN NEW YORK.

The last number to hand of "Progressive Age" contains some particulars in regard to the above disaster, in addition to those given in the "JOURNAL" for the 3rd inst. It appears that the list of deaths numbers eight; and, as already reported, several persons were injured, and there was much damage to adjacent property. The Coroner's investigation into the cause of the accident is now in progress; but it may be some time before his report is published. In the meantime, the holder has been sold as scrap, and the remains are in course of removal.

It will no doubt be remembered that the tank which gave way was 178 feet in diameter and 42 feet deep. The bottom was of $\frac{3}{8}$-inch riveted mild steel plate, as the rest of the tank was supposed to be; and the side plates had the following dimensions:—

Thickness. Inches.	Width. Inches.	Thickness. Inches.	Width. Inches.
$1\frac{1}{2}$	49	$\frac{13}{16}$	51
$1\frac{3}{8}$	49	$\frac{11}{16}$	57
$1\frac{5}{16}$	49	$\frac{5}{8}$	57
$1\frac{1}{16}$	52	$\frac{7}{16}$	57
$\frac{15}{16}$	52	$\frac{3}{8}$	68

The height of the holder was 160 feet; the framework rising about 11 inches higher. The columns were of lattice construction, lattice girders stiffened the top of the tank, and the lateral bracing was of round and flat members, all resting upon the coping of the holder and directly over box brackets reaching to within three plates of the bottom of the tank. A rather small angle-riveted connection joined the side with the bottom. The latter rested upon a bed of concrete, as shown in fig. 1, and there was no other external support or brace outside this foundation.

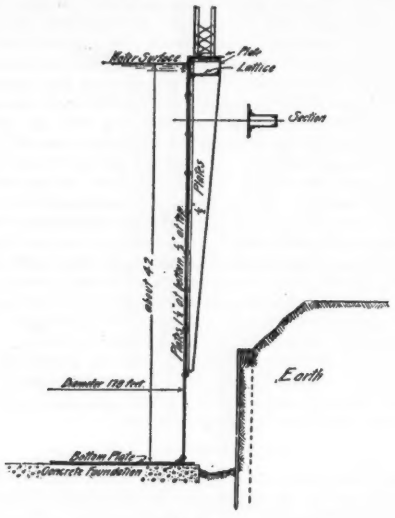


FIG. 1.

A visit to the site soon after the accident disclosed the following facts: The bottom plate was intact. The side plates were torn away from the bottom plate along practically the entire circumference, and the edges of the latter were bent down in many places; showing that the sides bent outward before fracture took place. In parts the angle connection was split at the angle—in some places along the rivet-holes; while in others the rivets were pulled out of the bottom plate, in nearly every case leaving the bottom uninjured. There was no perceptible evidence of settling, and the bottom was apparently in its original position.

Coming to the side plates, fractures were visible everywhere. It seems probable that the side of the tank first split from bottom to top at the side touching 21st Street; and that the part to the east opened out like a door—sheering away from the bottom plate. The part to the west, fronting the street, was also sheered from the bottom, and pushed out until it struck the bank of the excavation and broke off sharp at the surface; the superstructure with its columns being carried to the other side of the street. To the west the tank and lifts were pressed against the bank, and the lifts battered down in the middle by the columns falling inwards; those falling over 21st Street evidently dragging the others in their direction. This is shown plainly in fig. 2, which is a view looking toward 21st Street. It will be seen therefrom how the top lift at the right of the view was drawn along, by the issuing current of water, from its central position toward the north-east and south-east, where the largest openings were. One of the fractures is shown in fig. 3. Inside the tank the timber posts were battered down and splintered. The columns falling inwards upon the crown of the upper lift carried large fragments down to the bottom with them, and crashed through the timber. The boxes upon which the lifts rested when down were intact. The rivets were of good quality, and the riveted joints seemed strong enough—very few of them having failed. A part of the tank thrown up on the north side showed where the plate below it broke off along the single line of rivet-holes. Our contemporary thinks this may be significant as indicating that the plates in its neighbourhood did likewise, and "point a moral" in regard to riveting thick plates. The principal point for discussion, however, is the design with reference to the superstructure supports and the quality of steel used; and on these matters the following remarks are offered.

FIG. 2.—THE DEMOLISHED LIFTS.

Attention is first called to the fact that, as shown in fig. 1, the steel brackets reached to within three sheets of the bottom, and that, therefore, the entire weight of the superstructure rested upon these sheets; and any side movement of this structure would cause the toe of the bracket to press inward or move outward. The steel plates seemed strong enough to withstand the hydrostatic stress. Supposing a head of water of 41 feet (which means a hydrostatic pressure of 17·8 lbs. per square inch) on the lower plate, there would be a tensile strain of about 12,700 lbs. per square inch. The unit tensile strength of this mild steel should be at least 35,000 lbs.; and the tank at this point should have been nearly three times as strong as necessary. A point was made by the "Railroad Gazette" that the weight of the superstructure greatly increased this stress by introducing sheering strains, and that the tank must have increased its diameter about 2 inches under pressure; this increase taking place in the middle only, as the bottom was rigidly fastened to the bottom plate and the top held firmly by the coping and a lattice girder. Our contemporary says that this enlargement would be probable if the steel really had the elongation it should have; but this is doubtful. Undoubtedly the weight of the superstructure had a decided influence; and still more such strains as may have been caused by lateral pressure against it, due to

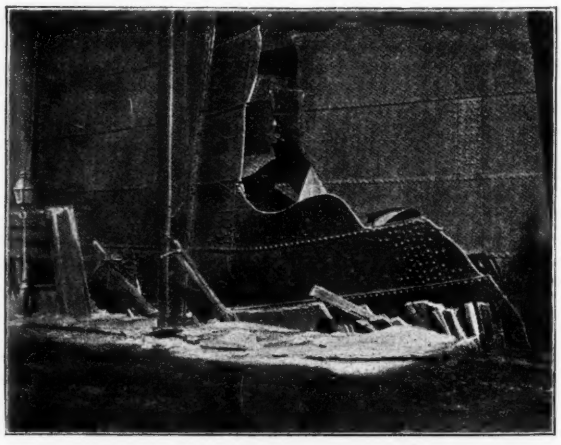


FIG. 3.—FRACTURE ON SOUTH SIDE OF TANK.

wind or other causes. The "Engineering News" says: "The question what stresses were set up in the plates of the tank by these brackets and the weight which they supported is worth consideration. It may, of course, be that this method of support was the usual and proper one; but no reason is apparent why the overhead structure might not have been as well supported by independent piers of masonry—thus avoiding any possibilities of distortion of the huge water-tank."

The writer in "Progressive Age" closes his remarks by saying

that probably the most important lesson to be learned from the disaster is as to the character of the steel itself. It is supposed to be mild steel, which should be quite ductile, bend readily, and have considerable elongation and toughness. What he saw in the tank itself was plates that were broken like glass in long curved lines across and through the plates, as if there had never been a region of weakness along the rivet lines. He also noticed that when the heavy plates bent through an angle of (say) 10 degrees, they broke off sharp. All fracture surfaces were straight and sharp-edged, and the surfaces of coarse structure; the whole resembling the fracture of cast iron. There was not, he says, a single heavy sheet that was not broken upon being bent to any extent; and the fractures presented square edges and flat surfaces without the jagged appearance which often accompanies the tearing of soft steels. As to whether this brittleness was due to sulphur or to an excess of carbon in the composition, to cold rolling, to overblowing of the Bessemer heat, or other details in manufacture, remains to be seen. The rivets held well, and the cases were few where the side plates broke along the rivet lines.

LOSS OF ILLUMINATING POWER OF GAS MIXED WITH AIR.

It may be remembered that one of the papers read at the last meeting of the American Gaslight Association was by Dr. E. G. Love, the Gas Examiner of New York, who dealt with the loss of illuminating power sustained by gas of 25 to 30 candle power when mixed with air. The paper and the discussion to which it gave rise were noticed, in our abstract of the proceedings at the meeting, in the "Journal" for the 6th ult.; but the communication was of such interest as to justify its reproduction in full, with the diagrams accompanying it.

In 1862, Messrs. Audouin and Bérard published, in "Annales de Chimie et de Physique," the results of some experiments on the effect upon the illuminating power of gas of various admixtures of air.* This table, in a greatly abridged form, has been frequently referred to by writers for the past 35 years, usually without any mention or even knowledge of its origin, or the conditions under which the tests were made. These experimenters used the low-quality coal gas of Paris; and as they were studying a problem in street lighting, they burned it in a batswing burner at the rate of 140 litres (4·94 cubic feet) per hour. They found that 1 per cent. of air reduced the illuminating power 6 per cent., 2 per cent. of air reduced it 11 per cent., 3 per cent. of air reduced it 18 per cent., and so on. The percentage of loss for each per cent. of air varied considerably, according to the quantity of air in the mixture. Thus, the first per cent. reduced the illuminating power 6 per cent. But in a mixture containing 7 per cent. of air this had increased to 7·57 per cent.; while in a 40 per cent. mixture each per cent. had a deleterious effect of only 2·47 per cent. Mr. R. H. Patterson, in commenting on these results in 1880, and without any knowledge of their authorship, except that they had been quoted by Dr. Letheby, expressed some doubts as to the correctness of the figures, as it did not seem to him probable that the first 10 per cent. of air added should reduce the light by 67 per cent., while the fourth 10 per cent. reduced it only 2 per cent.

In 1878, Mr. H. Aitken published some results on mixtures of air with gas of 27·8-candle power—probably a cannel gas.† No mention is made of the burner used; but, judging from the quality of the gas, we should infer it was a flat-flame, although the results obtained would indicate that an argand was employed. His experiments included four mixtures, containing respectively 0·5 per cent., 1 per cent., 5 per cent. and 10 per cent. of air; and the results show that the deleterious effect of each per cent. of air in these mixtures was 4·82, 4·42, 2·94, and 2·52 per cent.

Some figures were published by Mr. B. W. Smith in 1885, showing the effect of air on 16·6-candle coal gas consumed in an argand burner.‡ The mixtures employed contained from 0·25 to 3 per cent. of air; and the results show a fairly constant effect for each per cent. of air in the mixture—being 3·6 per cent. for 0·25 per cent. mixture, and varying from 4·2 to 4·62 per cent. for mixtures containing from 0·5 to 3 per cent. of air.

Dr. Schilling and Inspector Ries made some experiments in this direction in 1891, in which coal gas of 19-candle power was used, and the tests were made with a slit burner. The mixtures contained 2, 4, 6, and 8 per cent. of air respectively; and the deleterious effect on the illuminating power of each per cent. was found to be 7·25, 6·70, 6·27, and 6·02 per cent.§

It may be of interest, in this connection, to mention the experiments by Dr. Percy F. Frankland, in 1884, on mixtures of ethylene and air.‖ He tested six mixtures in which the air varied from 20·32 to 77·69 per cent. In mixtures containing up to about 40 per cent. of air, the percentage of loss corresponded with the percentage of air in the mixture; but from this point the air had a slightly increasing deleterious effect.

For convenience, I have placed in the following table the results with coal gas just referred to; and I think you will admit that the record is rather confusing.

Percentage of Air in Mixture.	Audouin and Bérard, 1862. 12 to 14-Candle Gas. Flat-Flame Burner.		H. Aitken, 1878. 27·8-Candle Gas.		B. W. Smith, 1885. 16·6-Candle Gas. Argand Burner.		Schilling and Ries, 1891. 19-Candle Gas. Flat-Flame Burner.	
	(a)	(b)	(a)	(b)	(a)	(b)	(a)	(b)
0·25	..	..	..	..	0·90	3·60	..	..
0·50	..	..	2·41	4·82	2·10	4·20	..	..
0·75	..	..	..	..	3·31	4·41	..	..
1·00	6	6·0	4·42	4·42	4·51	4·51	..	..
1·25	..	..	..	..	5·40	4·32	..	..
1·50	..	..	..	..	6·62	4·41	..	..
2·00	11	5·5	..	..	9·03	4·51	14·5	7·25
3·00	18	6·0	..	..	13·85	4·62	..	..
4·00	26	6·5	..	..	..	..	26·8	6·70
5·00	33	6·6	14·70	29·4	..	..	..	..
6·00	44	7·33	..	..	..	..	37·6	6·27
7·00	53	7·57	..	..	..	..	..	..
8·00	58	7·25	..	..	..	..	48·2	6·02
9·00	64	7·11	..	..	..	..	..	..
10·00	67	6 7	25·23	2·52	..	..	..	..
15·00	80	5·33	..	..	..	..	..	..
20·00	93	4·65	..	..	..	..	..	..
30·00	98	3·26	..	..	..	..	..	..
40·00	99	2 47	..	..	..	..	..	..
45·00	100	..	..	..	..	..	..	..

(a) Loss per cent. (b) Loss per cent. for 1 per cent. of air.

The work of Audouin and Bérard in this line was but a small part of an investigation on gas-burners carried out under the direction of MM. Dumas and Regnault; and for this reason, if for no other, it is, I think, entitled to great weight.

It would be foreign to the purpose of this paper to enter into any extended examination of the results obtained on the deleterious action of air on coal gas; but there are one or two points to which I wish to call your attention.

It is generally understood that an illuminating gas of low quality suffers more by admixture with incombustible diluents than a gas of high-candle power, and that in either case the injurious effect is much greater with flat-flame burners than with argands. If we assume that the figures reported by Aitken were obtained with an argand, and we compare them with those obtained by Smith, we see that the deleterious effect of 1 per cent. of air is practically the same with a gas of 17-candle power as with one of 28-candle power. On the other hand, if they were obtained with a flat-flame burner, is it probable that the effect is so much less with a 28-candle gas than with a 14 or 19 candle gas, as shown by the tests of Audouin and Bérard and of Schilling? Moreover, it is a matter of surprise that in the Aitken experiments the effect of 1 per cent. of air in a 10 per cent. mixture should be only 2·52 per cent., while it was 4·42 per cent. in a 1 per cent. mixture.

Does the injurious effect of 1 per cent. of air in mixtures containing from 2 per cent. to 8 per cent. increase, as shown by Audouin and Bérard, or decrease as shown by Schilling? In a word, what is the effect upon the candle power of a coal gas of the addition of various proportions of air when the mixtures are tested in the consumer's flat-flame burner? It may be possible to reconcile, to some extent, the results given in the table; but it seems to us that, if this is done, it must be by a more careful and extended study of the effect of air upon the different hydrocarbons which contribute light to the flame.

So far as I am aware, no experiments have been made to determine the effect of air upon the illuminating power of water gas, especially of 25 to 30 candle power; and I therefore offer the following results as a small contribution in this direction. The tests here recorded were made in five series, each of which included a number of mixtures covering a wide range in the percentages of air and gas. Where mixtures in different series were found to have practically the same composition, the results obtained with such mixtures were averaged. The illuminating power of the gas used in the different series was 26·36, 26·50, 26·48, 25·86, and 25·30 at 60° Fahr. and 30-inch pressure, tested by the Bray slit-union burner No. 7. This burner was also used in testing the air-gas mixtures; and the consumption was in all cases regulated to 5 cubic feet per hour. The mixtures of air and gas were made by measure; but these were checked by analyses of the mixtures, samples of which were taken in tubes placed just before the burner. No attempt was made to test mixtures containing very small percentages of air; the lowest being 2·82 per cent., and increasing from this to 40·8 per cent., at which point the loss of illuminating power was 93·8 per cent. The following table gives the results obtained:—

Percentage of Air in Mixture.	Loss of Illuminating Power. Per Cent.	Loss of Illuminating Power for 1 per ct. of Air. Per Cent.	Percentage of Air in Mixture.	Loss of Illuminating Power. Per Cent.	Loss of Illuminating Power for 1 per ct. of Air. Per Cent.
2·82	5·72	2·03	17·65	44·30	2·51
4·94	10·08	2·04	19 84	51·19	2·58
5·40	11·24	2·08	21·56	56·69	2·63
8·51	18·04	2·12	22·22	58·88	2·65
8·95	19·06	2·13	24·16	64·51	2·67
9·62	21·16	2·20	27·69	72·82	2·63
10·40	23·24	2·24	31·30	80·44	2·57
11·20	26·66	2·38	32·95	83·36	2 53
12·35	29·02	2·35	34·53	87·02	2·52
12·81	30·48	2·38	37·50	90·37	2·41
15·25	37·66	2·47	40·79	93·82	2·30
16·98	42·28	2·49			

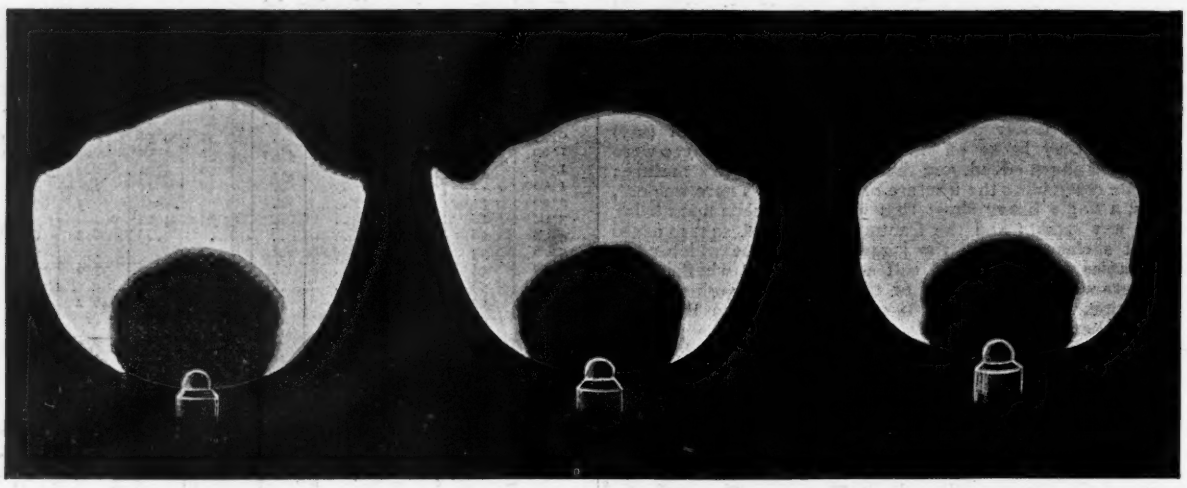
* See "Journal," Vol. XI., pp. 733, 799, 830.

† *Ibid.*, Vol. XXXI., p. 802.

‡ *Ibid.*, Vol. XLVI., p. 602.

§ *Ibid.*, Vol. LIX., p. 65.

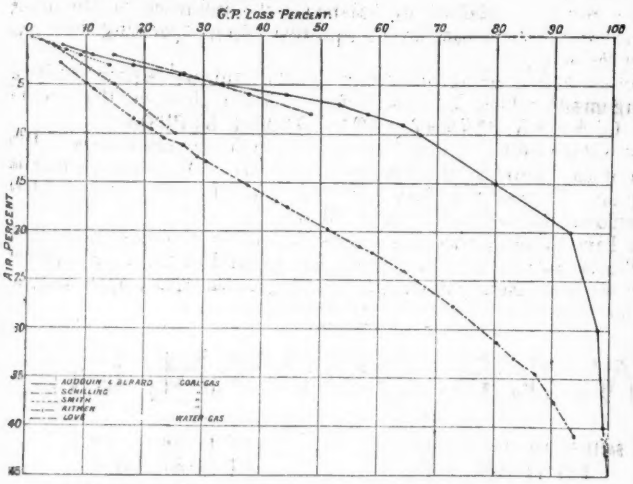
‖ *Ibid.*, Vol. XLIV., p. 17.



No Air. 6·8 per Cent. of Air. 11·3 per Cent. of Air.

18 per Cent. of Air. 25·7 per Cent. of Air. 36 per Cent. of Air.

From this it appears that, with low percentages of air, the percentage of loss is a little more than twice the amount of air present in the mixture; that as the quantity of air increases, its deleterious effect increases in a somewhat higher ratio—reaching a maximum with about 25 per cent. of air; and that from this point the rate of depreciation gradually decreases until the flame has lost its illuminating power.



If these results are compared with those of Audouin and Bérard, it will be noticed that, though the rate of loss is much greater in one case than in the other, the general distribution of this loss is practically the same in both cases. Owing, however, to the greater rate of loss in the case of coal gas, the practical disillumination of its flame occurs with a much lower percentage of air than in the water-gas flame. Thus, with a mixture containing 20 per cent. of air, coal gas loses 93 per cent. of its illuminating power, while with a corresponding mixture water gas loses only one-half.

No very close comparisons can be made, however, between the results in the case of water gas and those obtained by Audouin and Bérard with coal gas, for, apart from the difference in their quality, the gas in the former case was burned under conditions best suited to develop its illuminating power, while the burning of a low-quality coal gas in a flat-flame burner is a very effective means of destroying its luminosity.

On the accompanying diagram I have plotted the results referred to in the case of coal gas together with those obtained with water gas. The ordinates indicate percentages of loss in illuminating power, and the abscissæ percentages of air in the mixtures.

As regards the appearance of the flame from a mixture of air and water gas, it may be said that, with mixtures containing about 5 per cent. or less of air, the eye alone is hardly able to detect any difference except with the help of a comparison flame, and even then the most noticeable change is a slight reduction in size. The addition of larger percentages of air produces very marked changes in the flame, which rapidly diminishes in size, and has a dull and impoverished appearance.

The accompanying photographs* will give some idea of the relative sizes of flames consuming gas and different mixtures of gas and air; the consumption in each case being 5 cubic feet per hour. As these flames were photographed instantaneously, and by means of their own light, the blue zone appears somewhat larger than it really is, since the more feeble light from the upper portion of this zone was not able to impress the photographic plate during the time of the exposure.

Though the argand plays no part in the official testing or practical use of rich water gas, it was thought to be a matter of interest to know the effect of air as shown by this burner; and an effort was made to determine this. But the experiments were too few to warrant my giving any figures. It may be said, however, that the loss is very small. The presence of air is shown at once by the appearance of the flame; and indeed it is more noticeable here than on the photometer disc. The first

* Slightly reduced from the originals.

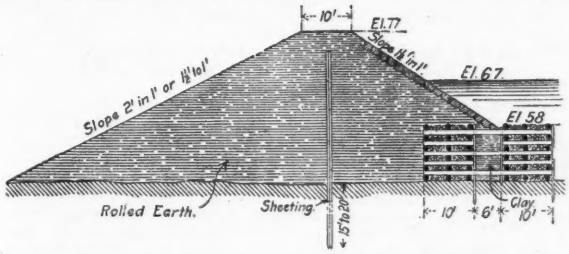
effect is a shortening of the flame, followed by the disappearance of its reddish and more or less irregular tip, and a decided increase in the intensity of the brighter portion. This effect is merely intensified as the percentage of air in the mixture is increased, until with about 25 per cent. of air the height of the flame is reduced fully one-half. The effect is similar to that produced by lengthening the chimney. It is very desirable that a careful revision be made of the results so far obtained on the depreciating effect of air on coal gas, and also that the experiments here recorded with water gas should be repeated by others who may be more fortunately situated than the writer for the carrying on of such work. Every experiment made with care and under known conditions is of value in reaching the desired result.

THE NEW CROTON DAM OF THE NEW YORK WATER-WORKS.

References have been made in the "JOURNAL" from time to time to the great dam near Croton Landing, New York, which is to impound water for the supply of two of the boroughs of the city. The Chief Engineer of the work is Mr. Alphonse Fteley, the President of the American Society of Civil Engineers; the Contractors being Messrs. Coleman, Breuchaud, and Coleman. The construction of the dam was the subject of an elaborate article in the "Engineering Record" in June last year; and in a recent issue our contemporary gave a few particulars as to the progress of the work, from which the following extracts are made.

Contract work was commenced in the summer of 1892 by the construction of diversion works to exclude the Croton River from the site of the dam. This comprised an upper and a lower wing dam across the old bed of the river, and a new temporary channel or bye-pass connecting their northern ends. The bye-pass is a canal, 100 feet or more in width, blasted out of the rocky hillside, and protected towards the dam by a massive retaining wall, 630 feet long, 23 feet high, 13 feet thick at the bottom, and 6 feet thick at the top. This wall and its dams in seasons of low water have only to resist a shallow stream; but in floods they have withstood safely a stream many feet deep, with a swift current and a volume of 15,000 cubic feet per second. The foundation was carried down everywhere to sound, hard rock, often penetrating many feet below the loose or decayed upper portions, and to a maximum depth of 130 feet below the river bed. This involved about a million cubic yards of excavation, and produced a pit 1300 feet by 500 feet on the top, and 300 feet deep from the highest point of the excavated surface. Below the present top of the masonry the bottom of the pit is being back-filled with spoil, rammed against the face of the dam. This work especially is being pushed during the winter weather. The core-wall trench is cut right through the side of the main excavation, and is 75 feet deep, down into the solid rock. It is 25 feet wide, with a stepped bottom, and heavily timbered.

As the security of the men at work in the deep foundation pit depended on the stability of the diversion dams, they were designed to be much more secure than is often the case with temporary structures. A cross-section of the upstream dam is given in the accompanying illustration. It is built mainly of



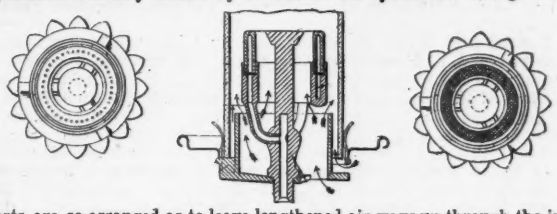
rolled earth on a prepared earth surface, in which is driven a core wall of two thicknesses of tongued and grooved 3-inch sheet piling. The base of the dam is about 110 feet wide, and has on the river side a timber crib 12 feet high and 36 feet wide, which is made with three pockets; the middle one being filled with puddled clay, and the side ones with stone ballast. The upstream sides of the outer pockets are faced with sheet piles, driven 4 or 5 feet into the ground; and the timbers are drift-bolted together. The river slope is paved. The lower diversion dam is similar to the upper one, with the exception that there is a riprap of heavy stones under and at the lower side of it, and covering the top of the crib and the adjacent foot of the paved slope, so as to protect it from erosion in times of freshet.

The total height of the finished dam will be 290 feet from the bottom of the foundations, and 144 feet from the top of the fill on the up-stream side, where the water will be 130 feet deep. It will contain something like 670,000 cubic yards of masonry, and will cost about $5,000,000, of which about $2,800,000 have already been paid to the Contractors on the Engineers' estimates. A maximum force of about 800 men is employed on the work; and as much as 17,000 cubic yards of masonry have been laid in a month.

REGISTER OF PATENTS.

Gas-Burners.—Johnson, A. T. M., of Highbury, N. No. 3221; Feb. 9, 1898.

This "improved argand" consists (as shown) in the combination of (1) a cylindrical casing formed with inner and outer walls, against the interior of the outer one of which closely fits the chimney; (2) several studs or rests located within the wall, and constituting a seat for the chimney; (3) circumferential slots in the outer wall of the cylindrical casing arranged between the studs; (4) a central hollow stem fixed with the cylindrical casing, and adapted to be connected with the gas-supply pipe; (5) an annular chamber formed with a seat to receive a nipple, and supported by pipes or conduits from the hollow stem a short distance from the cylindrical casing, so as to leave a space between the parts; (6) a nipple fitted to the seat; (7) a wire-gauze gas-distributor, placed within the annular chamber; (8) a deflecting-button carried by the stem; and (9) a cylindrical chimney carried by the seat of the cylindrical casing. The



parts are so arranged as to leave lengthened air-ways up through the inside of the burner and around the outside of the annular chamber and nipple. The chimney holder consists of a long cylindrical casing, extending some distance below the nipple of the burner, and a chimney closely fits the holder with air-ways through the cylindrical casing and between the chimney and the annular chamber and nipple. In this way, the gas issuing from the perforations when ignited, forms an annular belt of flame which creates a rapid draught of air through the burner one current passing through the length of the enclosed air-way formed by the cylindrical casing to the interior of the burner, where it is caused by the button-head of the hollow stem to impinge upon the inner wall of the flame at or near the point of ignition; while the air which flows through the slots in the cylindrical casing, passes up through the latter and the space between the chimney and the burner to the exterior of the flame. It is claimed that "these currents of air thus promote or induce rapid combustion."

Extracting the Benzols contained in Heavy Oils, and Classifying or Fractionating the Hydrocarbons which accompany the Benzols.—Pitt, S.; a communication from the Société Anonyme pour la Construction des Appareils Savalle, of Paris. No. 19,321; Sept. 10, 1898.

According to this invention, the benzols and the several hydrocarbons accompanying the benzols are volatilized by the passage of a current of steam. According to the nature of the heavy oils, either cast-iron bubbling columns analogous to those used in the distillation of alcohol, are employed, or, in order to prevent the emulsion which might be produced with certain heavy oils, plain distillatory columns are used, provided with cast-iron, stoneware, or other baffles, in which the hydrocarbons are carried over solely by intimate contact of an ascending current of steam with a descending current of heavy oil which flows in thin layers over the baffles. This heavy oil is previously heated by the heat carried by the debenzinized mixture of water and oil leaving the bottom of the column. By the employment of a steam-regulator, the temperature of the gaseous current escaping from the top of the column is maintained between 97° and 98° C., which mixture is composed of steam, in large excess, and the vapours of the hydrocarbon carried over. Under these conditions, not only is benzene completely carried over, but also the higher hydrocarbons up to, and including, naphthalene.

In order to obtain almost all the naphthalene and the hydrocarbons more condensable than toluene, and consequently a relatively pure crude benzol, "it is sufficient to employ an arrangement the action of which is based upon the existence of definite mixtures of steam and hydrocarbons, each boiling at a definite temperature, and consequently each condensing at a definite temperature at the ordinary pressure." For example, naphthalene which when pure boils at 222° C. forms with steam a mixture which distils at 98° C., and condenses at the same temperature. This mixture is composed of 100 parts of water to 18 parts of naphthalene. As regards benzene, a mixture containing 100 parts of benzene and 8 parts of water distils and condenses at 67° to 68° C. With toluene, this mixture distils at 80° C.

If, therefore, the steam be slowly and progressively cooled, maintaining a temperature a little above 80° C., and if the condensed products be extracted continuously as they are liquefied, almost the whole of the water, the naphthalene, and the several higher hydrocarbons, will be eliminated—small quantities of benzene and toluene only being lost, on account of their solubility in the condensed products. The gaseous mixture which escapes condensation (principally benzene, toluene, and a small quantity of steam) is led to an ordinary refrigerator and completely cooled.

It has been stated that the mixture of water, naphthalene, and higher hydrocarbons carries over small quantities of benzol. This is recovered by leading the products collected in the hot condenser into a small distillatory column traversed from bottom to top by the vapours from the main column, and communicating at the top with the hot condenser. There escapes then from the lower part of the column a mixture of naphthalene, higher hydrocarbons, and hot water. The first being less dense than water at this temperature floats; and the employment of a simple Florentine receptacle, with double effect, enables the complete extraction of the several hydrocarbons to be accomplished. These are cooled, and then pressed.

There is obtained, on the one hand, crude naphthalene in a solid state; and, on the other hand, an oily matter containing all the liquid hydrocarbons and the phenol retained by the hot condenser. The two portions of liquids thus collected are then submitted separately to the usual processes of washing with sulphuric acid, water, and soda; and then they are rectified.

Incandescent Mantles.—Thompson, W. P.; a communication from O. Lenz, of Berlin. No. 20,740; Oct. 1, 1898.

The patentee states that the mode of manufacturing incandescent mantles usually practised is based on the supposition that the faculty of emitting light of sufficient strength is due to the mixture of salts or earths employed for the purpose. Experience and a long series of experiments, however, have proved that this supposition is false. "Each of the salts or oxides is glowing for itself, and only the mixture of the rays of light emitted is the cause of the excellent illuminating effect visible." If, for instance, an incandescent mantle is previously prepared by impregnating fibrous material with a solution of zirconium, thorium, magnesium, or calcium, and eliminating the fibrous matter by combustion, as usual, and if the mantle thus prepared is subsequently brought into a solution of cerium, chromium, uranium, or a mixture of such metallic salts, it will be found that the mantle, which "first yielded but a very poor light, has obtained, by such subsequent treatment, a strong illuminating faculty."

Having established these "facts," the object of the present invention is "to provide an incandescent mantle not only of great illuminating power but also of superior stability and duration."

A solution of nitrate of cerium, soluble in solutions of other salts, is first prepared, and boiled, whereby part of the mixture of cerium is precipitated and separated. The precipitated powder (containing about one-fifth of the mixture of cerium in the solution) is then withdrawn, and the remaining fluid, containing about 80 per cent. of the mixture of cerium, is employed to form a coating for incandescent mantles. Such a coating is prepared in the following manner: From 10 to 20 grains of the fluid before described (the quantity varying according to the desired shade of white or yellow of the light to be produced) are added to 1 litre of any fluid commonly employed for stiffening incandescent mantles after combustion, so as to render them capable of transport. By coating the mantle, after combustion, with the stiffening fluid, to which an extract of cerium has been mixed, the mantle is said to obtain not only "an excellent illuminating power, but also great durability; and its faculty of emitting light does not depend on the particular kind and nature of the salt or oxide which had been used in first preparing the incandescent mantle subsequently coated." By further adding to the coating fluid a small quantity of yttrium, the mantle will become "as hard as stone."

As a modification, an unprepared mantle of any known kind is first impregnated with a solution containing: 30 parts of nitrate of zirconium, 3 parts of nitrate of calcium, and 1½ parts of nitrate of magnesium. After drying, the mantle is subjected to combustion, as usual; and by treating it with a mixture of 0·04 per cent. of chromic acid, and of 0·06 per cent. of nitrate of uranium, and subsequently coating the mantle with a stiffening fluid, as described (containing an extract of nitrate of cerium), an incandescent mantle will be obtained having "the combined faculties of a strong emission of a mild, agreeable, yellowish-white light, a long durability, and a very strong construction, which latter may be further increased by adding to the coating-fluid a small quantity of yttrium."

APPLICATIONS FOR LETTERS PATENT.

755.—Rudge, J., "Reflectors and shades for lamps." Jan. 12.
776.—Roderick, R., "Glass chimneys for gas and other lamps." Jan. 12.
778.—Craig, A., "Internal combustion engines." Jan. 12.
784.—Simpkins, A. H., and Lee, E. C., "Acetylene generator." Jan. 12.
827.—Aykroyd, J. & B., "Acetylene generators and lamps." Jan. 13.
846.—Acres, B., "Apparatus for increasing the pressure of service gas." Jan. 13.
848.—Lake, H. H., "Manufacture of mantles and the like for incandescence gas lighting." A communication from Max Kaenopff. Jan. 13.
873.—Redman, T., "Atmospheric gas-burners." Jan. 14.
908.—Boult, A. J., "Supports or brackets for lighting and other purposes." A communication from W. S. Arnold. Jan. 14.
938.—Barnett, C., "Producing acetylene gas." Jan. 14.
940.—Ricaris, C. de, "Manufacture of a complex carbide, and of a gas therefrom, and apparatus therefor." Jan. 14.
947.—Bastick, J., "Production of calcium carbide." Jan. 16.
1013.—Stevenson, S., "Coke-breaking machines." Jan. 16.
1020.—Mills, B. J. B., "Production of carburetted gas." A communication from La Société Anonyme des Fontaines à Gaz. Jan. 16.
1056.—Barratt, F. W., "Acetylene gas lamps." Jan. 17.
1074.—Allen, T. G., jun., "Producing perfect combustion of acetylene." Jan. 17.
1090.—Turnock, G., "Acetylene lamps." Jan. 17.
1109-10-11.—Jansen, A. D., and Sutherland, A. C., "Conveyor or conveying apparatus." Jan. 17.
1112.—Lair, P., "Explosion engines." Jan. 17.
1114.—Teter, W. L., "Generating and utilizing gaseous fuel." Jan. 17.
1137.—Moeller, J., "Incandescence gas-burners." Jan. 17.
1157.—Brown, C. G. & A. H., and M'Cabe, A. R., "Adjustable draught regulator for incandescent gas-burners." Jan. 18.
1161.—Foster, A. G., "Gas-burners for stoves, grates, and the like." Jan. 18.
1190.—Garthorn, M., and Fairley, J., "Valves for air and gas compressing, blowing engines, and the like." Jan. 18.
1212.—Snell, C. S., "Gas-compressing apparatus suitable for incandescent gas lighting." Jan. 18.
1217.—Wetter, J., "Acetylene gas generators." A communication from E. Prat. Jan. 18.
1235.—Himmel, G., "Incandescent gas street-lamps and the like." Jan. 18.
1282.—Adamson, A. G., "Obtaining coal or other gas or gases under high pressure, in connection with the light obtained from incandescent mantles." Jan. 19.
1308.—Rowbotham, W., "Explosion engines." Jan. 19.
1312.—Wood, J., and Clark, W. W., "Generating acetylene gas." Jan. 19.
1331-2-3.—Vriesland, A. I. van, "Carburetting apparatus." Jan. 19.
1366.—Foulis, W., "Stirring and drawing the charge of gas and other retorts, also applicable to apparatus for charging said retorts." Jan. 20.
1398.—Osten, W., and Nicoll, P. F., "Acetylene gas generators." Jan. 20.
1406-7.—Sander, J., jun., "Gas and other engines." Jan. 20.
1416.—Smith, F. H., "Explosion engines." Jan. 20.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Improved Sulphate Working at the Widnes Gas-Works.

Sir,—On reading Mr. Isaac Carr's report on the above subject in your issue of the 17th inst. (p. 135), one naturally wonders what the cost of manufacturing sulphate at Widnes could have been prior to the adoption of Mr. Carr's improved liquor heater, that by its use he is able to effect such a large saving. In the interests generally of sulphate makers, may I ask Mr. Carr if he will, through the medium of the "Journal," give the items of cost of manufacture per ton of sulphate, and also the quantity made per ton of coal carbonized?

Sheffield, Jan. 24, 1899. Fletcher W. Stevenson.

Mr. Herring's Report on the Proposed New Granton Gas-Works.

Sir,—After reading the text of Mr. Herring's report on the proposed new gas-works for Edinburgh, with which you favoured your readers in your last issue, I feel I cannot refrain from expressing my appreciation of so important a document, written in so clear and concise a manner. Without doubt, the opportunities thus given of becoming acquainted with such valuable reports are of great educational service to that younger generation of gas engineers who are "knocking at the door."

Naturally, in such a report there will be many points on which engineers will not all be agreed; but, on the other hand, as one who has had experience of gas-works in Italy and elsewhere, I feel how extremely accurate are many of the observations of Mr. Herring on Continental practices. Who does not know of the extra finish of the Continental work in regard to butt ends and joints in girders or curbs of gasholders, as compared with the more or less roughly finished work at home? It is high time that British contractors looked to their laurels in these matters, which very often are of more importance than is commonly supposed.

I was glad to note that the value of the Pelouze and Audouin condenser had not been overlooked by Mr. Herring. But does he not err in saying that "this apparatus is placed immediately in front of the exhauster, and the gas drawn through it"? Of course, there are works on the Continent in which this is done; but the Continent is a big place, and consists of more than one or two countries. I can answer for the general practice in France and Italy, which undoubtedly is to place the Pelouze condenser *after* the exhauster, for the reason that the tar contained in the gas greatly assists in the lubrication and easy working of the exhauster slides.

One may remark that no mention of the exhausting plant of the gas-works is made; and there are other points—such as the valves proposed for purifier-boxes—that would have been interesting if touched upon.

I can only say, however, that a debt of gratitude is due to Mr. Herring for such interesting and instructive reading as his report contains, and to you for the printing of it *in extenso*.

7, *Drapers' Gardens, E.C.*, *Jan.* 28, 1899. C. E. Brackenbury, Assoc.M.Inst.C.E.

Sources of Water Supply and the Fever Death-Rate.

Sir,—In the coming session of Parliament, there will be a large crop of Bills relating to water supplies; and the advocates of lakes, chalk springs, and rivers will contend in the committee-rooms over their pet schemes. It may therefore be interesting to your readers to compare the death-rate from fever in the principal cities of England and Europe for the first three quarters of the past year with the same period of 1897. The death-rate has been computed, to avoid decimals, at per million living. Those who prefer to consider the question at a rate per 1000 will find it only necessary to put a decimal point three places to the left.

One cannot help being struck with the uniformity of the incidence of the fever death-rate for 1897 and 1898 in the same towns. In some towns fever appears endemic; while in others it is reduced to insignificant numbers. Belfast had during this period a far higher death-rate from fever than any other town in Europe. Belfast, Manchester, Glasgow, Liverpool, and Sheffield obtain their water from moorlands and lakes; nevertheless the fever-rate is very high.

The year 1898 was remarkable for the small amount of percolation, and for many weeks there was absolutely none. Consequently, it was not surprising to find that in Hull, Portsmouth, Bristol, Brighton, and Croydon—towns which derive their supply of water from the chalk—the mortality from fever was less than in 1897; but we must expect, on the rising of springs after the late heavy rains, that during the next three months there will be a corresponding rise in the fever death-rate.

Water which has been exposed to air and light for a considerable time, and then efficiently filtered, is improved in quality; consequently, London, Paris, Berlin, Copenhagen, Cologne, Hamburg, Nuremberg, Dresden, Altona, and Vienna have had a very low fever death-rate. On the other hand, in the limestone districts of Lenz, Rheims, Metz, Prague, and where the water is obtained from shallow wells, as in the highly cultivated districts about Malines, Bruges, and Namur, the mortality has been excessive, owing to pollution of subsoil water. Antwerp is a good illustration of a town whose supply which is derived from a highly polluted stream (a tributary of the Scheldt) has, after treatment by passing through spongy iron and sand filters, become a good wholesome water, with a corresponding low fever death-rate.

Great Britain cannot pride herself on being the leader of sanitary progress. Taking 100 per million living as a standard for fever mortality, I find that 13 out of the 22 towns were in excess; while on the Continent only 17 out of 51 towns exceeded that figure—a fact not creditable to the Health Department of the Government. In Germany, sanitation has progressed by leaps and bounds, with the result of a marked improvement in the death-rate from preventable disease. The Imperial Government has not been hampered by any motives of vote-catching, or consideration for the scruples of the conscientious objector. The reckless manner in which the Local Government Board have in the past sanctioned sewage farms and cemeteries upon permeable and water-bearing strata, from which increasing populations are either at the present time drawing, or will in the near future draw, their water supply, must inevitably tend to

Town and Source.	Jan. 1 to Oct. 1, 1898.	Jan. 1 to Oct. 1, 1897.
Great Britain—		
Belfast (moor)	1667	955
Dublin	420	290
Norwich (chalk)	197	182
Salford	190	210
Glasgow (moor)	184	188
Liverpool (moor)	172	146
Birmingham	168	130
Sheffield (moor)	160	182
Newcastle	152	105
Nottingham	150	150
Manchester (moor)	133	110
Hull (chalk)	114	159
Portsmouth (chalk)	112	185
Bradford (moor)	90	82
Leeds (moor)	89	94
Edinburgh	78	72
Cardiff	73	70
Leicester	68	122
London (river)	67	79
Brighton (chalk)	66	123
Bristol (chalk)	56	56
Plymouth	40	61
Croydon (chalk)	24	75
France—		
Le Havre (chalk)	509	277
Rheims	270	137
Nancy	185	186
Lyon	144	147
Paris	62	71
Lille	55	27
Germany—		
Koenigsberg	213	204
Stettin	137	141
Metz	136	250
Halle	88	99
Dantzig	79	94
Cologne (river)	68	69
Strasburg	63	87
Brunswick	56	58
Barmen	53	53
Bremen	48	21
Germany (*continued*)—		
Hanover	44	37
Leipsig	43	77
Charlottenberg	43	20
Chemnitz	41	18
Hamburg (river)	39	42
Berlin (sand)	38	37
Crefeld	37	47
Nuremberg (river)	35	18
Stuttgart	27	nil
Dusseldorf	26	27
Magdebourg	24	60
Dresden (river)	24	22
Altona (river)	18	52
Munich (river)	12	55
Frankfort-on-the-Main (river)	12	37
Belgium—		
Malines (well)	440	351
Bruges (well)	433	200
Namur (well)	399	434
Brussels	110	161
Lausanne	96	72
Antwerp (river)	71	112
Liege	66	102
Seraing	54	nil
Verviers	69	58
Holland—		
Rotterdam (sand)	102	69
Amsterdam (sand)	82	18
La Haye (sand)	41	42
Denmark—		
Copenhagen (sand)	56	45
Sweden—		
Stockholm	75	41
Gothenbourg	9	131
Austria—		
Lenz (chalk)	385	290
Budapest	168	132
Prague (limestone)	159	202
Brunn	147	69
Vienna (river)	46	35

increase the severity of the constantly recurrent outbreaks of preventable disease.

Every local authority or water company should be compelled by law to send a monthly chemical and bacteriological analysis of every source, if more than one, of their supply to the Local Government Board, who should report the results annually to Parliament, and also to the County Councils within their area of supply. Some sources of supply now in use would be condemned, and preventable disease diminished.

A. H. Smee.

Carshalton, Jan. 18, 1899.

Public Lighting by Acetylene.—The streets of Schonsee (West Prussia) are now lighted by means of acetylene, the work having been carried out by the Allegemeine Carbid und Acetylen Gesellschaft, of Berlin. The Company have also a contract for a similar installation at Oliva, near Dantzig.

The Gas and Water Supply of St. David's.—The Engineer to the proposed St. David's Water and Gas Company has deposited an estimate of the cost of the works which are sought to be constructed under the Bill "for supplying with water and gas the City of St. David's and the adjacent places." The estimate puts the cost of the works, including the purchase of the necessary lands, at £4500; and the share capital of the Company is to be only £16,000.

Inclined Retorts for the Brighouse Gas-Works: The Gas Engineer and the Town Clerkship.—The principal business before the Brighouse Town Council last Wednesday was a recommendation of the Gas Committee that £10,550 be spent upon new producing plant for the gas-works. Alderman Sugden, the Chairman of the Committee, stated that they had inspected a number of gas-works, and after due consideration they advised the Council to accept the tender of Messrs. Jonas Drake and Son, of Halifax, for an installation of inclined retorts and coal and coke conveyers at the Mill Lane works, for the sum named. The tender was accepted. Before the close of the proceedings, Mr. D. Hardaker gave notice that, at the next meeting, he would move that, in consequence of the extensive alterations to be carried out at the gas-works, the Town Clerk (who is also the Gas Engineer) be instructed to devote his whole time to the Gas Department, and that a legally qualified Town Clerk be appointed.

The Opposition to the Yeadon and Guiseley Gas Bill.—At a special meeting of the Yeadon District Council on Monday last week, it was reported that the Rawdon and Guiseley District Councils had decided to join in opposition to the Gas Company's Bill; and a telegram was received from Mr. C. M. Tankard, the Chairman of the Menston Parish Council, stating that that body would do all that the law would allow them. After a lively discussion, a resolution was adopted deciding to oppose the Bill in its entirety. Six of the eight members present voted for the resolution, and one against, while Mr. Yeadon was neutral. During the discussion, Mr. Jenkinson, who is a Director of the Company, pointed out that, under the proposed Bill, for every penny the price of gas was reduced below the standard price of 3s. 6d., the consumers would get £250, against the shareholders' £74. This, he said, did not look like doing anything unfair to the consumers. The price of gas at Menston at present was 3s. 11½d.; so that under the Bill the Menston people would get a reduction of 5½d. per 1000 cubic feet. The Company had no idea of discontinuing the 10d. per 1000 cubic feet discount. At an adjourned conference on the same day of the delegates from the various authorities concerned, reports were presented from each authority on the lines indicated; and it was decided that the costs of the united opposition should be apportioned on the basis of the rateable value of the districts served by the Company. The Clerks to the Guiseley, Yeadon, and Rawdon District Councils were empowered to take preliminary steps for putting matters in proper legal form.

PARLIAMENTARY INTELLIGENCE.

PRIVATE BILLS (SESSION 1899).

Opposition on Standing Orders.

Monday, the 23rd inst., was the last day for the deposit of memorials complaining of non-compliance with Standing Orders in the case of the remaining petitions for Bills. On that day, the only memorials presented related to the London Water (Aqueducts and Works) Bill; and they were from J. Searle and others, Sir J. Russell Bailey, Bart., and others, and the Middlesex County Council. The petitions for the following Bills will not therefore be opposed before the Examiners: Airdrie and Coatbridge Water Bill, Birmingham Corporation Bill, Bootle Corporation Bill, Bristol Gas Bill, Bury Corporation Bill, Coalville Urban District Gas Bill, Cobham Gas Bill, Crowborough District Water Bill, Derby Corporation Water Bill, Gainsborough Urban District Council Gas Bill, Gaslight and Coke Company Bill, Goole Urban District Council Bill, Hastings and St. Leonards Gas Bill, Herne Bay Water Bill, Lea Bridge District Gas Bill, Leigh-on-Sea Urban District Council Bill, Loughborough Gas Bill, Mid-Kent Gas Bill, Nuneaton and Chilvers Coton Urban District Council Bill, Rawtenstall Corporation Water Bill, Scunthorpe Urban District Gas Bill, Shirebrook and District Gas Bill, Wakefield Corporation Bill, Walker and Wallsend Union Gas Company (Electric Lighting) Bill, Walton-on-Thames and Weybridge Gas Bill, Yeadon and Guiseley Gas Bill.

EXAMINER'S ROOM, HOUSE OF COMMONS.

(*Before Mr.* Campion.)

LONDON WATER (WELSH RESERVOIRS AND WORKS) BILL.

On Wednesday, the 18th inst., the memorial complaining of non-compliance with Standing Orders in the case of the petition for the above Bill, which is to enable the London County Council to collect and store water in the watershed of the River Wye, in Breconshire, in accordance with the scheme which has been described in our columns, came before the Examiner. As already mentioned, it was deposited in the name of Stephen Thomas and others, and was signed by upwards of a hundred owners, lessees, and occupiers of property affected. It was 40 yards long, and was made up of various lengths of parchment fastened together. The case for the memorialists was conducted by Mr. Rees (of Messrs. Rees and Frere); the promoters being represented by Mr. H. L. Cripps, the Council's Parliamentary Agent. The proceedings occupied the Examiner till last Friday. The allegations brought before him on the first three days were mainly to the effect that certain owners, lessees, and occupiers were not named in the book of reference, or that, while they were named in respect of some properties, they had received no notice with regard to others. Ten cases were withdrawn; and as to twenty others, the Examiner said he should report that the parties had received due notice as to some of their property but not as to other portions. The inquiry was then adjourned till the 23rd inst., when a fresh batch of cases, in which it was alleged that, though the memorialists were named in the book of reference no notice had been served upon them, were taken. In some instances the allegations were sustained; but in others the Examiner declined to allow them on the ground that the promoters had exercised ordinary care. On the following day, objections raised that certain properties affected were neither numbered on the deposited plans nor inserted in the book of reference were sustained. On the 25th inst., cases were considered in which complaint was made that numbers which did not appear on the plan were to be found in the book. The Examiner said that, as a matter of theory, every separate enclosure ought to have a number on the plan; but he could not, in practice, hold that the mere omission of numbers was a fatal objection. Mr. Legge, for the County Council, said he had referenced the property in question, and the numbers relating to it appeared on the working plan, though not on the one deposited. In cross-examination by Mr. Rees, witness said he was not responsible for the absence of the numbers on the deposited plan; and he did not know who was. The Examiner said the property had been correctly described in the book of reference; the difficulty being only as to the numbering on the plan. He did not consider the allegation of sufficient importance to sustain. A memorialist complained that he had not received notice in respect of a quarry; and the Examiner sustained the allegation of non-compliance. On Thursday, cases were considered in which the memorialists complained that the book of reference contained more numbers than were shown on the deposited plan; and the allegations in this respect were sustained. Where there were misdescriptions of property, some of the allegations were upheld; while others were passed—the errors being regarded as immaterial. The inquiry closed on Friday, when other cases of alleged non-compliance were sustained. In the course of the proceedings on that day, it transpired that the gentlemen engaged to check the referencing were employed at the instance of Messrs. Hollams, the Solicitors to the Metropolitan Water Companies. The chief of the staff stated that he had had 43 years' experience at the work, and was upon the ground for sixteen days. He went over all the property, and saw every lessee, owner, and occupier. Asked by Mr. Frere (in the absence of Mr. Rees) if he thought the referencing had been properly done, he replied: "It was done in a very lax way, and not as expert referencers would have done it. They took 40 days to do it." Some further cases having been withdrawn, the inquiry concluded. The allegations sustained will, in due course, come before the Standing Orders Committee of the House.

Monday, Jan. 23.

(*Before Mr.* Thoms.)

NEWHAVEN AND SEAFORD WATER BOARD BILL.

The petition for the above-named Bill, which is being promoted by the Urban District Councils of Newhaven and Seaford to enable them to purchase the undertaking of the Newhaven and Seaford Water Company, was to-day examined in regard to compliance with Standing Orders.

Mr. Pritt (of Messrs. Sherwood and Co.) appeared on behalf of the

promoters; Mr. H. L. Cripps (of Messrs. Dyson and Co.) represented the Newhaven and Seaford Water Company and other objectors.

Mr. Cripps said the Bill was promoted by two Local Authorities jointly, on behalf of themselves and possibly a third, with the object of acquiring compulsorily the property which at present belonged to one portion of his clients. There was a Company in existence, and the Local Authority were endeavouring to turn them out and acquire their property compulsorily. Householders and ratepayers, in addition to those interested in the Company, had signed the memorial against the Bill, which not only provided for the purchase of the undertaking, but proposed to confer on the promoters power to supply water, not only within the present area, but also in a very considerable territory adjoining the Newhaven and Seaford district. The title of the Bill itself did not adequately describe its intentions, for it spoke of Newhaven and Seaford only; but its provisions applied to a large adjoining property, reaching as far as Lewes. It provided for the constitution of a Joint Board, consisting of members nominated by the urban districts of Newhaven and Seaford, termed "constituent districts," and, further, that any urban district afterwards created in the at present rural parishes covered by the operations of the Bill might become a constituent authority. If there was a deficiency in the net revenue of the proposed Board after providing for the purposes mentioned in the Bill, the Board were authorized to ascertain the amount, and apportion it between the constituent authorities and issue precepts; and the amounts were to be paid by the constituent authorities out of their respective district funds and general district rates. If any authority failed to pay what was apportioned to it, the amount due would bear interest, until payment, at the rate of 4 per cent. per annum; and the Board could proceed to recover the sum in various specified ways, including the appointment of some officer of the Joint Board to raise the money by means of a rate levied in the same way as the authority itself ought to have levied it. But the notices for the Bill did not state as among its objects the intention to charge any of the constituent authorities with interest on any amount apportioned to them. This was the first objection urged.

Mr. Pritt contended that it was quite an ordinary business proceeding to charge interest on overdue accounts; and no one need become a constituent authority unless a desire was expressed to do so.

The Examiner decided that the allegation had not been sustained.

Mr. Cripps next argued that, in regard to the levying of rates, mention was only made of the Newhaven and Seaford districts, and not of any district hereafter to be created.

Mr. Pritt pointed out that it was impossible to specify districts not yet created. The area comprised in the Bill included five other small parishes, all in the Newhaven Rural District, and did not touch any other urban district.

Mr. *R. Lambe*, the Chairman of the Newhaven and Seaford Water Company, having given evidence,

The Examiner declined to sustain the objection, thinking the notice sufficient.

Mr. Cripps's next allegation was that, under the definition of the term "constituent authorities," contained in the Bill, the Urban District Council of any district formed within the area added to the Newhaven and Seaford districts would be required to pay a proportion of the costs, charges, and expenses of promoting the Bill. The notices for the Bill, however, did not state among the objects of the intended application the proposal to charge on such urban districts after to be formed any proportion of such costs.

Mr. Pritt contended that the last ruling covered this objection.

The Examiner held that the notice was sufficient.

Mr. Cripps's next allegation referred to clause 45 of the Bill, in which it was proposed that the Joint Board might hold any lands required by them, and such lands should not be deemed superfluous within the meaning of the Lands Clauses Act. The notices for the Bill did not state as an object of the Bill the modification of the provisions of that Act relating to superfluous lands.

Mr. Pritt said he had expressly given notice of their intention to hold lands; and he contended that this took it out of the Lands Clauses Act, and that they were doing nothing inconsistent with it. The plot of land referred to was a very small one, and merely the place where the pumping-station, reservoirs, &c., were to be built.

The Examiner held that in this instance the notice was not sufficient.

Mr. Cripps next dealt with clause 49 of the Bill, by which it was proposed that the water to be supplied should be constantly laid on under pressure, but that the Board should not be required to supply water in any case at a pressure greater than that to be afforded by gravitation from the service reservoir from which the supply was afforded. He said the notices for the Bill did not state as among the objects of the intended application the exemption of the Board from the obligations of the Water-Works Clauses Act, 1847, with respect to the supply of water under such a pressure as would make it reach the top storey of the highest houses within the limits of supply.

Mr. Pritt contended that, so far as the present district was concerned, they were not altering existing legislation, because they were acquiring the undertaking of the Company, including the provisions contained in their Act. With regard to people living outside the existing area, one of the main objects of the Bill was to enable the Board to construct a new service reservoir at a higher level than the present one, which would enable them to supply all the houses in the new district.

The Examiner did not sustain the allegation.

Mr. Cripps next pointed out that in the Bill it was proposed to extend the provisions of section 72 of the Water-Works Clauses Act to all separate tenements let for any period. Under this provision, the proposed Board would be empowered to recover water-rates from the owners in lieu of the occupier. The notices of the Bill did not state that this change was to be made. The effect of the clause was to impose a new charge or liability upon the owners of all dwelling-houses rated at over £10, and let for less than three months.

Mr. Pritt said it was merely an alteration of existing rates levied by the Company, and notice was expressly given that it was their intention to alter the existing rates. The point, however, was one of little consequence to the promoters.

The Examiner sustained the objection.

Mr. Cripps next raised a point that no notice was given of the intention to alter the existing Company's rule so that the Board should not be bound to supply water other than by measure for trade purposes. The Bill was a distinct alteration of the existing rights of every ratepayer.

Mr. Pritt contended that there was nothing whatever to enable the Board to refuse to supply water; they could only insist on supplying by measure for trade purposes. It was merely an alteration of the mode of charge. The notice of the Bill distinctly set forth that application would be made for power to vary existing charges. The object of the clause was merely to prevent misuse of water supplied for domestic purposes.

This objection was not sustained.

Minor objections as to the supply of fittings and the imposition of penalties were overruled.

Objection was next made that the notices did not apply to the following objects: Powers to the Board to sell all or part of their undertaking; the restriction of the exercise by the Board of their right to oppose any future application to Parliament or to the Local Government Board by a local authority; the fixing of the method of ascertaining the amount to be paid in respect of any purchase; and other matters.

Mr. Pritt contended that all these matters were general obligations they were bound to come under, and that therefore no notice was needed.

The objection was not sustained.

Mr. Cripps finally contended that the notices of the Bill were not headed by a short title descriptive of the undertaking or the Bill, according to the true intent and meaning of the Standing Orders. There was nothing whatever to show that the Bill applied to a large area extending to the boundaries of Lewes.

The Examiner overruled the objection; and the proceedings then closed.

LEGAL INTELLIGENCE.

A Question as to Gas-Engine Patents.

In the Chancery Division of the High Court of Justice last Tuesday, before Mr. Justice Kekewich, the hearing was commenced of an action brought by the British Motor-Car Syndicate, Limited, and the Great Horseless Carriage Company, Limited, against Messrs. J. E. H. Andrews and Co., Limited, of Reddish, to restrain an alleged infringement by them of a gas-engine patent, for recovery of damages, and delivery up of the infringing articles. Mr. Fletcher Moulton, Q.C., M.P., Mr. Terrell, Q.C., and Mr. Walter appeared for the plaintiff Companies; Mr. Cripps, Q.C., M.P., and Mr. Graham represented the defendants. Mr. Moulton said the patent in dispute was known as Lanchester's patent, and it for the first time solved the difficulty of mechanically starting gas-engines. It had been already supported by the Court, but under unusual circumstances, as the defendants, after fighting the case right up to the day of the trial, did not then appear, and the plaintiffs proved their case and got a certificate of validity. Mr. Cripps remarked that the present defendants had nothing to do with the other case. Mr. Moulton then gave a technical description of the patent, and explained the alleged infringement. He said the defendants, in their engine, had chosen an alternative method of lighting by means of an incandescent cap; but their igniting mixture was formed in exactly the same way as plaintiffs'. They had made a slightly different arrangement of the parts; but their process was identical in substance, and, he submitted, entirely within the claims of the plaintiffs' specification. Mr. Dugald Clerk, was then called, and stated that Lanchester's specification was the first successful attempt to start a gas-engine by an explosion at atmospheric pressure. It was a very useful invention, and was employed in thousands of gas-engines. Professor J. Swinburne was also called in support of the plaintiffs' case. Sir Frederick Bramwell, for the defendants, said the gas-engine manufactured by them had no separate apparatus for ignition on starting, and came within Körting's specification of 1888. Mr. Justice Kekewich, in giving judgment, said that, in his view, the case was entirely governed by the construction of the plaintiffs' specification. The defendants did not infringe. They obtained the same result as by Lanchester's patent, but not by the same means; and though they obtained it in a way which Lanchester had alluded to as possible, they did not use the means by which he claimed the patent. The action must therefore be dismissed, with costs. Mr. Moulton intimated that the case was of great importance to the plaintiff Companies; and they would take the opinion of the Court of Appeal.

Millowners' Water Rights.

In the Chancery Division of the High Court of Justice last Friday, Mr. Justice Kekewich had before him a case of importance to millowners who are dependent upon a running stream for the supply of the motive power for their mills. The action was brought by Mr. Roberts, the owner of a corn-mill in the parish of Llanllyfni, Carnarvonshire, for an injunction to restrain the Gwyrfai District Council from interfering with the natural flow of the stream which worked his mill. The stream in question flowed from a lake at the foot of mountains some distance above the mill. The defendants were the owners of land on one side of the water, and were proposing to construct a dam across the end of the lake, of which the stream formed the outlet, so as to increase the storage for the supply of water to their district. They purposed constructing a sluice in the dam, to regulate the outflow of the stream, and had offered to allow a sufficient outflow to work the plaintiff's mill; but he declined the offer—contending that he ought not to be at defendants' mercy, but was entitled to the free and uninterrupted flow of the water as it had always existed, subject only to the rights of other riparian owners. He submitted that the subtraction of water for the supply of defendants' district was not within their rights as riparian owners. Mr. Warrington, Q.C., and Mr. Byrn Roberts appeared for the plaintiff; Mr. Renshaw, Q.C., Mr. Macmorran, Q.C., and Mr. A. Glen represented the defendants. Mr. Justice Kekewich, in giving judgment, said defendants, in the exercise of what they considered their duty and within their powers, were altering the lake largely, and were constructing certain works with a view to supplying their district with water. It was not suggested that the plaintiff was any the worse, or that he would be any the better, for the alteration. His Lordship, if he might be at liberty to guess, would certainly hazard the conclusion that the plaintiff would be better off in the future than in

the past, for the flow of water to his mill would be more constant than before; the evidence showing that it had been of an intermittent character. But the plaintiff insisted that he was entitled to have what he had previously had, whether he would be better or worse off; and he protested against any alteration at all. A riparian owner was entitled to say that the water which flowed by his property, and which was used by him for ordinary, or it might be extraordinary, purposes, should be allowed to flow in the future as it had done in the past; and he was entitled to insist on this. It was said that the defendants had a right to interfere under section 332 of the Public Health Act, 1875; but he (his Lordship) held that the section cited did not enable the defendants to "injuriously affect" the plaintiff's right to an uninterrupted flow of water without his consent. They were interfering with his common-law right; and there was no statutory authority enabling them to do this. The result was that the plaintiff was entitled to the injunction he asked together with the costs of the action, with the exception of those occasioned by his claiming relief on the ground of prescriptive right. The injunction would be to restrain the defendants from causing a diminution in the flow of the stream by supplying water to their district.

The Cost of the Falmouth Rating Appeals.

At the East Kerrier Petty Sessions, held at Penryn last Wednesday, application was made for the taxation of the costs in the recent appeal cases. At the outset, Mr. J. H. Genn, the Clerk to the Assessment Committee, asked that the matter might be adjourned, on the ground that he had only received the bill of costs on Tuesday morning; and the Committee, who would meet on the following day, might have some instructions to give him. Mr. F. W. Nalder, the Solicitor for the appellants, opposed the application. There was no rule calling upon him to deliver a bill of costs at any particular time. Mr. Genn could have had it earlier if he had asked for it; but, in any case, there had been plenty of time to go through the bill. The Chairman (Mr. E. B. Beauchamp) said the Bench saw no reason for the adjournment; and the application would be refused. The total amount of the costs in the seven cases adjudicated upon by the Magistrates was £1010. The largest individual amount—£338—was that of the Falmouth Gas Company. Mr. Nalder pointed out that the Company's assessment was suddenly raised from £665 gross to £1898, and from £434 net to £979. Had the increase adopted by the Committee been carried into effect, the Company would have been mulcted in extra rates to the amount of £218 per annum in the town and parish of Falmouth, to say nothing of the parish of Budock. Capitalized at 20 years' value, the increase would represent upwards of £6000, which would have been deducted from the value of the works. Mr. Genn pointed out that Mr. Nalder had due notice of the course the Assessment Committee intended to take. Mr. Nalder was informed prior to the hearing that the whole of the cases might go straight to Quarter Sessions instead of coming before the local Magistrates. In reply, Mr. Nalder told him that no doubt his clients would prosecute their appeals at the Petty Sessions. He admitted that Mr. Nalder had to prove his case; but consideration should be given to the fact that the Assessment Committee gave notice of the course they intended to pursue. Mr. Nalder said he distinctly informed Mr. Genn that he could not assent to his suggestion. The Magistrates' Clerk asked why the appeals should go to Quarter Sessions, and not be dealt with by the Court? The Magistrates allowed £679 of the total costs, amounting to £1010. In the case of the Falmouth Gas Company, the appellants' costs were £338, of which the respondents were ordered to pay £212; and in the case of the Penryn Gas Company, the bill was reduced from £82 to £72. At a meeting of the Falmouth Board of Guardians on Thursday, the Clerk reported that the appellants' costs of the whole of the appeals heard at Penryn, by the borough as well as the County Justices, amounted to £1162. From this sum £357 had been taxed off; leaving £805 to be paid by the Assessment Committee. Mr. Knowles said they had only to grumble and pay.

The Reinstatement of Roads.

In the City of London Court, last Friday, before Mr. G. Pitt-Lewis, Q.C., Deputy-Judge, an action was brought by Joseph Watts, ship's fireman, against the East London Water Company to recover £50 compensation for personal injuries sustained. Mr. W. M. Thompson appeared for the plaintiff; Mr. J. Eldon Bankes and Mr. George Kebbell represented the Company. In October last the defendants were diverting one of their mains in Wade Street, Poplar. The work had been completed, but the stones in the roadway had only been temporarily put down; it being the duty of the Local Board to lay them permanently. The plaintiff's case was that the Company's men had left one of the stones 1½ inches above the others. He caught his foot in it, and was unable to follow his occupation for nine weeks. The defendants expressed regret that the plaintiff should have been hurt; but they denied that he could have fallen as alleged. The Deputy-Judge said he thought the plaintiff had told a straightforward story, and awarded him ten guineas and costs.

A Warning to Juvenile Prepayment-Meter Thieves.

Sitting at the Police Court for the Northern Division of Dublin last Tuesday, Mr. D. Mahony had before him a boy named Patrick Dooley, who was charged by the Alliance and Dublin Consumers' Gas Company with breaking open a penny-in-the-slot meter in a blacksmith's shop. The case was proved; and prisoner was sent to the Glencree reformatory for five years.

The Charge for Water for Road-Sprinkling Purposes.

In the "Journal" last week, we reported the proceedings in connection with the dispute between the Lambeth Vestry and the Southwark and Vauxhall Water Company in regard to the charge made by the latter for water supplied to the Vestry for sprinkling and cleansing roads. It may be remembered that the Vestry had been paying 8½d. per 1000 gallons for water used for these purposes; but Mr. Hopkins, by his judgment, reduced the price to 6d. Last Thursday, Mr. Gore-Browne attended at the Lambeth Police Court, on behalf of the Company, and asked his Worship to state a case for the consideration of the Superior Court, on the ground that in making his award he had left out of consideration some of the elements entitling the Company to receive something from the Vestry in addition to the amount paid by consumers supplied under the "most favoured" clause. Mr. Hopkins remarked that the whole question was one of fact, and not of law; and he therefore declined to state a case.

The Assessment of Water-Rates.

A case of some interest to owners and occupiers of country residences came before Messrs. W. S. Graves and Stewart H. Brown at the Woolton Petty Sessions on the 20th inst. Mr. T. Clarke, of Allerton Hall, was summoned by the Liverpool Corporation to show cause why an order should not be made upon him for the payment of £4 9s. 9d., the balance of water-rent alleged to be due from him. It was really a test question as to whether land adjacent to a mansion could be charged in respect of water-rent for domestic purposes. Mr. E. W. Pierce, Assistant Town Clerk of Liverpool, represented the Corporation; and Mr. A. G. Steel was Counsel for the defendant. Mr. Pierce submitted that Mr. Clarke had been charged water-rent for his premises, consisting of a mansion house and ornamental and park land. In the poor-rate assessment for the current year, the property was described as "House, garden, and park." The gross estimated value under the poor-rate assessment was £595; and the net value, £517. It was upon this assessment that the Corporation were compelled to base their rate. They had no power to depart from the terms of the Act of Parliament. Defendant had not appealed against the assessment, but had paid his rates on the £517. He pointed out that it would be impossible to get an occupier for such a mansion as Allerton Hall unless there were attached to it a certain quantity of ornamental or park land. This evidently was the reason which had actuated the poor-law authorities in not making a distinction when they valued the premises for the poor-rate. Under the Act, the Magistrates had no power to divide the assessment. Mr. Steel contended that the claim was inequitable and unjust, because the land, instead of being park land, as suggested, was used for the production of hay and for the grazing of cattle and horses. Moreover, he urged that there had been a change in the form of assessment for which there was no justification whatever. He submitted that the first charge on £404 was the correct one. Mr. Pierce replied that if the assessment were wrong, that was a matter which should be brought before the Assessment Committee. The Corporation were obliged to charge on the net valuation of £517, as it appeared in the rate-book. Evidence having been given that the land was used for producing hay and for grazing cattle, horses, and sheep, for which purposes it was occasionally hired, the Magistrates said they could not see that the rate, on the face of it, showed anything to warrant them in thinking that it was incorrectly levied. They therefore made an order for the payment of the £4 9s. 9d. and costs. On the application of Mr. Steel, a case for appeal was granted.

The Price of Gas at Middlesbrough.—At a meeting of the Gas Committee of the Middlesbrough Corporation last Wednesday, the recent application of large consumers for a concession in the price charged them for gas was fully considered; and it was eventually decided to make no reduction. A rough estimate of the loss which would be entailed suggests that the profits of the gas undertaking would be reduced by £1000.

Proposed New Gas-Works for Coventry.—In a report just issued by the Gas Committee of the Coventry Corporation, a proposal is put forward to acquire land at Folesbill for the purpose of erecting auxiliary gas-works. The Corporation Act of 1898, it may be remembered, gives power to take land otherwise than by agreement; and when this has been acquired, the erection of the works will proceed. The Committee's scheme will come up for discussion by the Council to-day.

A Big Benzene Ring.—A Hamburg correspondent writes to the "Daily Chronicle" as follows: "As the result of a conference of manufacturers which has just been held at Cologne, it has been decided to form what is virtually a big benzene ring. The Trust, which has been joined by some thirty leading producers in Germany, Belgium, Luxembourg, and Switzerland, is to last for three years, and embraces a consumption of 35,000,000 kilos. The members of the ring declare that the combination is the inevitable outcome of the action of the Standard Oil Company in putting up the price of the raw article to an exorbitant figure; thereby forcing them to put themselves in the position to make a corresponding increase in the price of benzene."

The Norwich Corporation and the Gas Company.—At the last meeting of the Norwich Town Council, Mr. Hackblock moved the adoption of a recommendation from the Law and Parliamentary Committee as to considerable sums charged as interest by the British Gaslight Company in their accounts, under the head of "general establishment charges," in addition to the statutory dividends and interest authorized to be paid upon capital under the Local Acts of the Company, and suggesting that an action be commenced against the Company for a rectification of the accounts, past and present, in which such improper charges had been included. He said that the attention of the Company had been called to the fact that they were charging 7 per cent. on working capital; and then they reduced it to 5 per cent., but the law only allowed 4 per cent. This excessive charge had been made for years. The opinion of an eminent Counsel had been taken on the matter, and he had advised the Committee that they had a good case against the Company. Mr. Clabburn seconded the motion. Mr. A. J. Young opposed the motion. He admitted that probably illegal and improper charges had been made on capital account; but he said the mistake was due to the form in which the accounts were prepared, and as soon as it was discovered a change was made. It was not desirable that the Law and Parliamentary Committee should take the action recommended, for if they won it it would be twenty years before the ratepayers obtained any material advantage, inasmuch as there was a large debit balance in the profit and loss account of the Company to be made up. He thought it would meet the case if the Corporation sent a protest to the Company. The motion was carried.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Accounts.

In the "JOURNAL" last week we noticed the report which the Directors of The Gaslight and Coke Company will present at the ordinary general meeting to-day. We now reproduce the principal items in the accounts for the six months ending Dec. 31, 1898.

The capital account shows receipts (with premiums, £1,582,800) to the amount of £13,105,800. The expenditure is shown in the following items:—

Expenditure to June 30, 1898		£12,545,407 16 8
Expenditure during the half year to Dec. 31, 1898, viz.:—		
Buildings and machinery in extension of works	£60,821 2 3	
New and additional mains and service-pipes	28,799 15 3	
Do. do. meters	34,548 0 1	
Do. do. stoves	24,519 10 6	
	£148,718 8 1	
Cr. by sale of surplus land	11,372 3 0	
		137,346 5 1
		£12,682,751 1 9
Balance of capital account		423,045 18 3
		£13,105,800 0 0

The revenue and net revenue accounts are given below.

The balance applicable for division is £416,495 15s. 0d.; and the statement showing how the Directors propose to appropriate it is as follows:—

Dec., 1897.		
.. ..	Net balance brought from last account	£51,854 19 8
£302,484 ..	Net revenue for the half year	364,640 15 4
74,519 ..	Amount to be withdrawn from the reserve fund	..
£377,003		£416,495 15 0
(12½ per cent.)	A dividend on the ordinary stock—	
£377,003 ..	12½ per cent. per annum on £5,922,230	362,736 11 9
.. ..	Balance carried to next account	£53,759 3 3

The three statements relating to the reserve, insurance, and depreciation funds show that the balances on Dec. 31 were as follows: Reserve fund, £49,868; insurance fund, £81,289; depreciation fund, £51,336.

The insurance fund had to bear during the past half year a payment of £55 10s. 2d. in respect of claims arising out of the explosion of gas in New Church Court, Strand, on Oct. 29, 1895; and a sum of £146 5s. 7d, the value of plant destroyed by fires in the Company's district.

The statements furnishing particulars as to working are as follows:—

STATEMENT OF COALS USED, ETC.

Description of Coal.	In Store, 30th June, 1898.	Received during Half Year.	Carbonized during Half Year.	Used during Half Year.	In Store, 31st Dec., 1898.
	Tons.	Tons.	Tons.	Tons.	Tons.
Common	125,788	1,073,633	959,666	1,698	238,057
Cannel	19,163	8,864	*7,422	..	20,605
Total	144,951	1,082,497	*967,088	1,698	258,662

* In addition to this quantity, oil and spirit, the equivalent of 52,963 tons of cannel were used during the half year.

STATEMENT OF RESIDUAL PRODUCTS.

Description.	In Store, 30th June, 1898.	Made during Half Year.	Used during Half Year.	Sold during Half Year.	In Store, 31st Dec., 1898.
Coke—tons	28,096	597,772	133,890	462,444	29,534
Breeze—tons	1,034	63,185	24,818	37,422	1,979
Tar—gallons	803,978	9,843,264	9,735,669	17,143	904,430
Ammoniacal liquor—butts	18,073	282,470	276,947	..	23,596

STATEMENT OF GAS MADE, SOLD, ETC.

Quantity Made.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lamps.
	Public Lights and under Contracts (estimated).	Private Lights (per Meter).		
Thousands.	Thousands.	Thousands.	Thousands.	
*10,928,545	542,772	9,716,486	10,403,251	52,345
†11,189,074	543,803	9,935,487	10,626,688	52,428

* Including 1,123,626,000 cubic feet of "oil gas." † December half year, 1897.

The last statement is the general balance-sheet. It shows that the

REVENUE ACCOUNT.

Dr. Cr.

December Half Year, 1897.		£ s. d.	£ s. d.	December Half Year, 1897.		£ s. d.	£ s. d.
	To Manufacture of Gas—				By Sale of Gas—		
	Coals, including oil, dues, carriage, unloading and trimming	634,037 4 8		£1,393,859	Common gas, per meter, at 3s. and 2s. 8d. per 1000 cubic feet	1,439,042 13 1	
	Salaries of engineers and other				Public lighting and under contracts—		
13,871	officers at works	14,410 16 4		77,598	Common gas	77,568 4 10	
168 827	Wages, carbonizing £160,278/9/8	177,143 8 8		£1,471,457			1,516,610 17 11
16,938	,, sundries £16,869/19/5			£14,222	Rental of stoves	..	20,179 7 7
	Purification, including £17,124/2/4				Residual products—		
33,474	for labour	37,511 0 5		£102,922	Coke, less £42,012 2s. 1d. for labour, &c.	254,485 13 10	
	Repair and maintenance of works and plant, materials and labour,			3,754	Breeze, less £2339 8s. 0d. for ditto	6,203 5 8	
152,759	less received for old materials, £2805 7s. 5d.	159,587 6 3		49,297	Tar and tar products	43,150 12 1	
			1,016,280 16 4	57,396	Ammoniacal liquor and sulphate of ammonia	67,500 6 1	
	Distribution of gas—			£313,355			371,836 17 3
	Salaries and wages of Officers						
31,145	(including Rental Clerks)	32,095 9 1		£4,817	Rents receivable		4,442 9 11
	Repair and maintenance of mains			223	Transfer fees		215 12 6
47,489	and service-pipes	46,818 16 2					
25,480	Repair and renewals of meters	25,504 16 1					
28,858	Stove fixing, repairs, and renewals	28,684 19 4					
			133,104 0 8				
	Public lamps—						
17,469	Lighting and repairing	..	17,347 18 0				
	Rents, rates, and taxes—						
5,639	Rents payable	5,509 2 5					
110,334	Rates and taxes	110,397 7 11					
			116,306 10 4				
	Management—						
2,750	Directors' allowance	2,750 0 0					
200	Company's Auditors	200 0 0					
	Salaries of Secretary, Accountant,						
9,514	and Clerks	10,944 10 0					
19,309	Collectors' commission	19,740 12 2					
7,031	Stationery and printing	7,668 7 5					
2,780	General charges	3,635 8 11					
			44,938 18 6				
..	Parliamentary charges	..	702 3 0				
2,799	Law charges	..	1,056 4 0				
5,314	Bad debts	..	4,906 14 3				
500	Depreciation fund for works on lease-hold lands	..	500 0 0				
12,288	Annuities	..	12,426 12 8				
..	Workmen's Compensation Account	..	2,500 0 0				
	Public Officers—						
1,338	Gas Referees and Official Auditor	1,274 0 7					
691	Public testing-stations	856 11 0					
			2,110 11 7				
£1,313,175			1,352,589 3 11				
490,929	Balance carried to net revenue account		560,196 1 8				
£1,804,104			1,912,785 5 2	£1,804,104			1,912,785 5 2

NET REVENUE ACCOUNT.

Dr. Cr.

December Half Year, 1897.		£ s. d.	£ s. d.	December Half Year, 1897.		£ s. d.	£ s. d.
£68,059	To Interest on debenture stocks and bonds, accrued to Dec. 31, 1898	..	64,159 12 6	£366,568	By Balance from last account	414,591 11 5	
74,002	Dividend on the preference stocks	73,999 5 0		9,355	Amount withdrawn from reserve fund	..	
47,500	Dividend on the maximum stocks	47,500 0 0		375,908		414,591 11 5	
			121,499 5 0		Less dividend on the ordinary capital		
3,884	Interest on temporary loans & sundry funds		9,896 8 5	375,908	for the half year to June 30, 1898	362,736 11 9	
302,484	Balance applicable to dividend on the ordinary stock		416,495 15 0				51,854 19 8
				490,929	Revenue account	..	560,196 1 8
£490,929			612,051 0 11	£490,929			£612,051 0 11

value of the stores on hand on Dec. 31 was as follows: Coals, £163,174; coke, £17,125; tar and ammoniacal liquor and products, £91,625; sundries, £263,978—total, £535,902. The figures at the corresponding period of 1897 were: Coals, £148,074; coke, £25,330; tar, &c., £124,654; sundries, £242,533—total £540,591. The item "automatic meter supplies (fittings account)" amounts to £299,902 as compared with £281,446 in the six months ending Dec. 31, 1897.

SOUTH METROPOLITAN GAS COMPANY.

The Half-Yearly Report and Accounts.

The following is the report of the Directors of the South Metropolitan Gas Company for the six months ending Dec. 31, which, with the accounts for this period, will be presented at the half-yearly general meeting on the 8th prox. :—

The accounts now presented for the half year to Dec. 31 last indicate a welcome revival in the value of coke, as well as a decided improvement in that of ammonia; resulting in a considerable excess in the receipts for products over the corresponding half year. There has also been an increase of 5 per cent. in the quantity of gas sold. During the half year, 2410 additional ordinary consumers, and 7827 using gas through the penny-in-the-slot meters, have been connected to the Company's mains. The latter class now reach the large number of 80,115.

On the other side the cost of coal and freight has increased; and more has been spent on repair and maintenance of works and on distribution charges. There has also been an advance of about 7½ per cent. on stokers' wages, which has to some extent put up the cost of carbonizing. The Company were the first to note that the law of supply and demand indicated that a rise of stokers' wages was reasonable. The statement has often been made that wages are never advanced except under pressure from the Trade Unions, and the uninformed public are apt to believe it. This is a mistake; and reference is made to the Company's action to refute the error.

The net result of the half-year's working is a balance on the revenue account of £190,423 1s. 10d., which, after meeting all charges for interest, paying the same dividend as in the previous half year—viz., 5½ per cent. —which the Directors recommend, and adding the balance of divisible profit of 3s. 4d. per cent., or £4666 13s. 4d., to the reserve fund, will leave £13,044 6s. 9d. to be added to the balance brought forward; thus making the amount to be carried forward £27,309 19s. 10d. The reserve fund will then amount to £106,043, and the insurance fund to £46,017, or a total of reserves, including the undivided balance, to meet contingencies, of £179,369.

The profit-sharing system introduced in 1889 continues to justify its existence. The only justification for this item in the accounts is that it is to the advantage of the Company; inducing a genuine and intelligent interest in its welfare on the part of a large proportion of its officers and workmen, who thus by their better work earn the profits that are distributed among them annually. The greater part of these profits during the last nine years has been invested in the Company's stock; and on the 31st of December last no less than 2860 of the officers and workmen, or nearly all those in constant employ, were shareholders, holding £56,580 of the ordinary stock of the Company, of a money value of about £80,000. They have in addition £29,000 on deposit with the Company.

At the general meeting in August last, a scheme, under the Company's Act of 1896, for the election of workmen Directors was submitted to, and adopted by the shareholders. This scheme was passed without alteration by the Board of Trade, and came into force at once. In October last, the workmen shareholders elected two of their number to sit on the Board. So far the results of the experiment have been satisfactory.

The Directors, taking into consideration the surplus profits, and anticipating a continuation of the Company's prosperity, have reduced the price of gas to the ordinary consumers 1d. (to 2s. 2d.), and to the consumers by the slot meters 2d. (to 2s. 11d.) per 1000 feet, from Christmas last. This reduction, small as it appears, will put upwards of £40,000

CAPITAL ACCOUNT.

	£ s. d.	£ s. d.
Capital account to June 30, 1898	..	3,700,226 3 9
Expenditure during half year to Dec. 31, 1898—		
New buildings and machinery in extension of works	14,273 10 6	
Purchase of land	7,000 0 0	
New and additional mains and services	17,397 13 4	
New and additional meters	21,335 12 10	
New and additional stoves	19,966 0 11	
		79,972 17 7
Total expenditure		3,780,199 1 4
Balance		116,620 5 4
		3,896,819 6 8
Nominal amount added on conversion		3,851,666 13 4
Total		7,748,486 0 0

Description of Capital.	Certified to June 30, 1898.	Received since that date.	Total.
	£ s. d.	£ s. d.	£ s. d.
Ordinary stock	2,315,000 0 0	..	2,315,000 0 0
Premium on do.	414,332 0 0	..	414,332 0 0
Debenture stock	893,333 6 8	..	893,333 6 8
Premium on do.	274,154 0 0	..	274,154 0 0
Total	3,896,819 6 8	..	3,896,819 6 8
Nominal amount added on conversion—			
Ordinary		£3,287,000 0 0	
Debenture		566,666 13 4	
			3,851,666 13 4
Total			7,748,486 0 0

REVENUE ACCOUNT.

To Manufacture of gas—		
Coal into store, including cost of petroleum spirit for enriching and including £22,032 18s. 6d. for labour	£264,509 6 6	
Purification, including £6558 4s. 4d. for labour	14,897 18 8	
Salaries of Engineer and Officers at works	6,747 2 8	
Wages (carbonizing)	56,159 6 4	
Repairs and maintenance of works and plant, including £41,962 8s. 2d. for labour, less £1993 18s. 6d. received for old materials	85,159 10 0	
		£427,273 4 2
Profit sharing		9,000 0 0
Distribution of gas—		
Repair, maintenance, and renewal of mains and service-pipes, including £13,064 9s. 4d. for labour	£17,731 12 2	
Salaries, &c., Officers and Rental Clerks	10,659 4 9	
Repair, &c., of meters (£2209 1s. 9d. for labour)	10,764 4 8	
Repair, &c., of stoves (£5058 8s. 11d. for labour)	8,549 13 11	
Gas-fittings (labour)	2,944 17 11	
		50,699 12 5
Public lamps—lighting and repairing, including £6750 6s. 7d. for labour		7,974 14 1
Rents, rates, and taxes—		
Rents payable	£928 12 4	
Rates and taxes	28,765 15 4	
		29,694 7 8
Management—		
Directors' allowance	£1,763 19 0	
Salaries of Secretary, Accountant, and Clerks	2,172 16 7	
Collectors	8,364 12 5	
Stationery and printing	1,817 8 0	
General charges	2,788 10 0	
Company's Auditors	75 0 0	
		16,932 6 0
Law charges	£262 9 6	
Parliamentary charges	45 13 0	
		308 2 6
Bad debts		1,323 5 5
Pensions and officers' and men's superannuation and sick funds		3,885 12 1
Gas Referees and Official Auditor		248 9 4
Total expenditure		£547,339 13 8
Balance carried to net revenue account		190,423 1 10
		£737,762 15 6

By Sale of gas—		
Michaelmas, at 2s. 3d. per 1000 feet	£173,759 14 3	
Christmas, at 2s. 3d. per 1000 feet	308,205 5 7	
	£481,964 19 10	
Public lighting and under contracts, including Lighting, Repairing, &c., £7974 14s. 1d.	32,554 11 7	
		£514,519 14 5
Meters in use: 181,480—		
Company's meters at rent: Ordinary, 93,289; automatic, 80,115	£17,521 17 11	
Company's stoves and fires at rent: Ordinary, 43,601; automatic, 62,845; fires, 9074	12,708 13 1	
		30,230 11 0
Residual products—		
Coke, less £889 17s. 11d. for cartage; £12,866 14s. 1d. labour, &c.	£139,599 8 7	
Breeze, less £399 11s. 10d. for cartage; £2364 18s. 7d. labour, &c.	5,632 8 6	
Tar, less £129 16s. 5d. for cartage; £298 4s. 5d. labour, &c.	15,912 8 7	
Ammoniacal liquor, less £254 1s. 5d. for labour, &c.	11,817 12 3	
Sulphate of ammonia, less £3192 15s. 5d. for acid, &c.; £1832 16s. 10d. labour, &c.	18,417 18 7	
		191,409 16 6
Rents receivable		1,532 16 1
Transfer fees		69 17 6
Total receipts		£737,762 15 6

PROFIT AND LOSS (NET REVENUE) ACCOUNT.

Interest on temporary loan and deposits		£1,861 3 11
Interest on debenture stock		21,900 0 0
Balance applicable to dividend on the ordinary stock		181,309 19 10
		£205,071 3 9

Balance from last account		£168,265 13 1
Less dividend for half year ended June 30, 1898	£149,333 6 8	
Divisible profit carried to reserve fund	4,666 13 4	154,000 0 0
		£14,265 13 1
Amount from revenue account		190,423 1 10
Interest on Bankers' balances		382 8 10
		£205,071 3 9

into the pockets of the consumers in the year. The difference in charge is due to the fact that the ordinary consumer fits up his house and pays rent for his meter and stove and gas-fire in addition to the charge for gas; whereas the consumer by the penny-in-the-slot meter has everything supplied and maintained by the Company under the above inclusive charge.

In accordance with the Act of Parliament, two Directors (Mr. Edward Henry Cardwell and Captain Heathorn) and one Auditor (Mr. George Maughan Footner) go out of office by rotation. They are all eligible for re-election, and offer themselves accordingly.

It will rest with the meeting to elect an Auditor in the place of Mr. William Westcott, deceased. Mr. Thomas Spooner Soden, a duly-qualified proprietor, has signified his intention to be a candidate for this office.

In the accounts accompanying the report, the first three statements relate to capital, and the next two to revenue. We give on p. 251 the capital, revenue, and net revenue accounts. Following these are the statements relating to the reserve, renewal, and insurance funds. They show that the balances on Dec. 31 were as follows: Reserve fund, £101,377; renewal fund, £17,942; insurance fund, £46,017. The statements dealing with the manufacturing operations of the Company furnish the following particulars:—

STATEMENT OF COALS.

Description of Coal.	In Store, June 30, 1898.	Received during the Half Year.	Carbonized during the Half Year.	Used during the Half Year.	In Store, Dec. 31, 1898.
	Tons.	Tons.	Tons.	Tons.	Tons.
Newcastle coal.	15,616	549,106	479,998	454	84,270
Cannel coal	1,225	320	202*	..	1,343
	16,841	549,426	480,200	454	85,613

* 271,880 gallons of petroleum spirit used as a substitute for cannel.

STATEMENT OF RESIDUAL PRODUCTS.

—	In Store, June 30, 1898.	Made during Half Year.	Used in the Half Year.	Sold in the Half Year.	In Store, Dec. 31, 1898.
Coke—cwts.*	27,671	5,930,218	1,151,223	4,521,511	285,155
Breeze—yards	1,773	96,741	15,562	77,490	5,462
Tar—gallons	415,510	4,717,058	87,385	4,666,489	378,694
Ammoniacal liquor—butts. .	8,997	154,026	72,488	72,987	18,158

*1 cwt. of coke about equals one sack of four bushels, under Weights and Measures Act, 1878.

STATEMENT OF GAS MADE, SOLD, &c.

Description of Gas.	Quantity made.	Quantity Sold.		Total Quantity accounted for.	Number of Public Lamps.
		Public Lights (estimated).	Private Lights (per Meter).		
	Thousands.	Thousands.	Thousands.	Thousands.	
Common .	4,969,489	231,447	4,445,662	4,744,382	20,940

The remaining statement is the balance-sheet, which gives the value of the stores in hand as follows: Coals and enriching materials, £46,914; coke and breeze, £9778; tar, sulphate, and liquor, £6867; and sundries, £133,793. The figures this time last year were: Coals, &c., £41,355; coke and breeze, £10,361; tar, &c, £6179; and sundries, £126,191. A sum of £16,865, workmen's bonuses and savings, has been deposited with the Company; and the total of the officers' superannuation and guarantee funds is £35,842.

A Conscience-Smitten Lamp Breaker.—The proceedings at the meeting of the Lancaster Town Council last Wednesday were marked by a novel incident. A letter was read from an anonymous writer, enclosing a postal order for 10s. as "conscience money." The writer stated that when a boy he threw a stone at a street-lamp and broke the glass, for which he was sorry, and sent the remittance to cover the cost. The Chairman of the Gas Committee said 549 gas-lamps had been broken, evidently wantonly, during last year, which had cost the Gas Committee from £80 to £100 to repair.

Alveston Water Supply.—Major-General Crozier, R.E., one of the Inspectors of the Local Government Board, held an inquiry last Thursday, at Alveston, with regard to an application by the District Council for leave to raise an additional £1230 to complete the water scheme for the parish. Mr. Willcox, of Birmingham, the Engineer for the scheme, attended. It appeared that the original application was for £2400; the assessable value of the parish being £4171. Sanction was given for £1100 for the purpose of sinking an experimental artesian well; and this proving successful, a further loan of £1170 was sanctioned for pipes and laying on the water. The present application raised the amount for the scheme to £3500.

Explosion of Acetylene Gas.—An explosion of acetylene gas occurred at the Wellington Hotel, Haverton Hill, near Middlesbrough, yesterday week. It appears that an installation of acetylene gas had just been completed; and the gas had been turned on ready for lighting, when the man in charge detected that there was an escape. He was proceeding to ascertain its whereabouts when a boy, who had been helping him, went upstairs and struck a light. The explosion which followed seems to have been a very violent one. The report, it is stated, was heard a mile away, the ceiling of the bar was blown down, a large plate-glass window was shattered to atoms, every window in the upper part of the house was destroyed, and some large pewter jugs standing on the bar were crushed as if they had been struck by a hammer. No personal injury, however, is reported.

ELECTRIC LIGHTING NOTES.

A Local Government Board inquiry was held at Lowestoft last Thursday into an application by the Town Council for leave to borrow £4709 for a refuse destructor, to be erected in combination with electric lighting works on Smith's Marsh. Several property owners in the vicinity objected to the erection of the destructor.

St. Austell has just been treated to a manifestation of the eccentricity of the electric light. The Public Hall of the town was crowded with people who had assembled to hear Mr. Stead on the peace proposals. Just as the speakers were going on the platform, the electric light went out. A few isolated gas-jets, which had been left for an emergency, dimly lit the corners of the hall, and saved it from absolute darkness. But the proceedings were delayed for a quarter of an hour before the light could be restored.

An additional expenditure of £3500 is required at the Southport electric lighting works; and application having been made to the Local Government Board for sanction to the borrowing of that amount, Mr. E. A. S. Fawcett inquired into the matter last Tuesday. It was shown that the money is required for the construction of a reservoir, to contain about a million gallons of water for condensing purposes. The engines at present at the works aggregate 1250-horse power; another 1000-horse power is now being put down; and, before the year is out a further 1000-horse power will be installed for the working of the trams. Each set of 1000-horse power will need 70,000 gallons of water per hour for condensing purposes.

An accident occurred at Southampton on the 21st ult., which resulted in the death by electric shock of a jointer in the service of Messrs. W. T. Glover and Co., the Contractors for the extension of the electric lighting system of that town. The matter was investigated by Major Cardew, whose report thereon has been published. The accident is, in the first place, attributed to the Corporation, who put great pressure on the Contractors to commence supply before the work was properly finished; and, secondly, to the fact that, in order to meet this demand, temporary joints were made connecting the cores of high-pressure cables at certain boxes. One of these temporary joints failed; and, being mistaken for a low-pressure joint, its repair was undertaken without cutting off the current.

We agree with a local paper in the remark that it was "rather inconvenient" for those shopkeepers who had no gas fittings when the electric light recently "refused to shed forth its rays" in the little town at King Cross, near Halifax. Two or three business men were in this position, and had to close their establishments at short notice, and for the time being bring to their aid the best light they could procure—the value of matches being appreciated until such a thing as a candle could be procured. At the Constitutional Club, the ball-room is fitted up with gas chandeliers; and it was but the work of a moment to light the gas. At the Liberal Club, they also had gas-fittings; but the beautiful effect of the decorations was spoilt, as Japanese lanterns hung across the room, each one containing an incandescent lamp, remained in darkness.

The people who have been grumbling at the nuisance caused by the Exeter municipal electric lighting works do not, it seems, know what they are talking about. They alleged that there was increasing noise, vibration, and smoke. The Electrical Engineer says, however, that there is no smoke, and there has been no ground for complaint on this score since the end of the coal strike. As to vibration, the station is on one side of a railway line, while the grumblers are on the other; and it is impossible for the vibration to be felt. More noise there has been, for a noisy exhaust was in use for a short time as a temporary measure during certain alterations at the works; but this is now stopped. A more serious trouble to the Engineer is the arc lighting of the streets. From the beginning there has been a series of difficulties over the lamps. He reported last week that he is in communication with the makers of those on the Davy principle respecting the trouble they continue to cause.

At the Manchester Town Hall last Tuesday, a meeting was held of the Executive Committee appointed at the recent conference of municipal corporations in Lancashire and Cheshire on the subject of the proposed Electric Power Bills. The Corporations of Liverpool, Manchester, Salford, Oldham, Blackburn, Bolton, St. Helens, Stockport, Bury, Wigan, Southport, and Chester were represented. It was resolved that communications should be made with all the municipal corporations in the area of the conference, urging them to adopt resolutions for opposing the second reading of the following Bills: General Power Distributing Company, Lancashire Electric Power Company, South Lancashire and Cheshire Electricity Company, Leicestershire and Warwickshire Electric Supply Company, and the Midland Electric Power Distribution and Lighting Provisional Order. It was also decided to ask the Corporations concerned to affix their seals to a petition against the Lancashire Electric and South Lancashire and Cheshire Bills.

We noticed in last week's "Journal" the Industrial and Arts Exhibition opened in Grahamstown on the 15th ult. It had not been running very long before a mishap occurred with the electric light; all the arc lamps going out one evening, and both arc and incandescent lamps failing the next, leaving the exhibition in total darkness, with the exception, as a local paper reports, "of the grand light from the South African Lighting Association's Stall of incandescent gas-burners." On one occasion, a violin solo was going on; and, owing to the performer's presence of mind in continuing to play, notwithstanding the extinction of the light, a panic was prevented. We learn that, in consequence of the unreliability of electricity, the Association are being asked to light up the orchestra and all the entrances and approaches with gas, and so prevent any trouble which might occur through the building being left in darkness. Mr. Arnott, the Manager of the Association, promptly scored, by calling attention, by advertisement, to the reliability of the lights at his stand.

The Teignmouth District Council are particularly unfortunate. They have had an unusual amount of trouble over their gas business, and now that they are contemplating the establishment of electric light works, they find the path by no means free from difficulties. Opposition to the Provisional Order is offered by the Great Western Railway Company, the Harbour Commissioners, and the Bridge Company. The two bodies last named are especially interested in the plans of the Council for laying a cable across the estuary of the Teign, in order to light the village of Shaldon, which, though cut off by the river, is in the area of the District Council. A meeting of the Council was held last Thursday to consider

the Order as revised to meet the objections. It was stated that the most serious of these was as to the possible hindrance to navigation, and that if this were overcome the other difficulties might be met. In answer to a remark about the expense of promoting an opposed Order the Clerk said they could not foresee the objections, and the only reasonable way of getting the Order was the one which had been pursued.

The Salford Corporation Electric Light Committee seem to have got themselves into a little muddle over the tenders for contemplated new electricity works, the cost of which is calculated at nearly £250,000. A recommendation was made by the Committee at the meeting of the Council on Wednesday that Messrs. Lacey, Clirehugh, and Sillar be appointed Consulting Engineers at a sum of £500 per annum; but an amendment was proposed to the effect that it should be referred back for further consideration. From the discussion which ensued, it appeared that certain firms had refused to tender for the new works, on the ground that there was something in the specification which was objectionable. Altogether 144 tenders were sent in, which, no doubt, had put the various firms to great expense; and the desire of the Committee was to secure their expert advisers before investigating the offers. The amendment already noticed was not accepted; but a further one was passed, adopting the Committee's recommendation on the undertaking that the present specification should be set aside, and a start made *de novo*. The tenders already received will consequently have to be returned to the senders.

The final ordinary general meeting of the Yorkshire House-to-House Company has been held; and it was presided over by Mr. Grosvenor Talbot. He stated that the Directors had paid an interim dividend of 5 per cent., which had absorbed £3671. They had now to dispose of the available amount—£7068 19s. 5d. The Directors now recommended a dividend, which, with the interim payment, would equal 6¾ per cent. per annum for the year ending Dec. 31 last. This made on the half year a dividend of about 8¾ per cent., and on the year 6¾ per cent. To show that they had handed over the concern to the Corporation in a state of great prosperity, he quoted the number of lamps installed during the nine months. In December, 1897, they had 49,150 lamps fitted; and at the end of September, 1898, there were 65,328—an increase of 16,178. This showed that the Company could have earned their dividend easily on the extended capital of another year's operations. They had in hand the £217,424 of Corporation 5 per cent. irredeemable stock paid for the concern; and it would have to be dealt with by the Liquidator of the Company. The report was adopted; and, at an extraordinary meeting subsequently held, it was agreed to voluntarily wind up the Company.

The complaints made at a recent meeting of the Chelmsford Town Council regarding the inefficiency of the electric lighting in the town somewhat worried the Secretary of the Electric Light Company (Mr. F. R. Reeves); and he asked and received permission to make a statement on the subject at the meeting of the Council last Wednesday. Whether his statement gave satisfaction to the members did not transpire; but Mr. Reeves made use of the opportunity to try to interest the Council in the question of purchasing the desirable and paying property possessed by his Company—at cost price! Referring first to the complaints, he pointed out that they were three in number—(1) That the private lighting was not what it ought to be; (2) That the public lighting was not sufficient; and (3) that complaint was made in regard to the way in which the mains had been laid down in the borough. India-rubber was considered the best insulator; but their experience had been that of nearly every other town—that india-rubber insulation failed in time. The reason some of the lights went out only the previous Sunday evening was the failure of the india-rubber insulation. The Company, however, were placing lead-covered cables in the town; and he hoped that one cause of the failure would be removed. Mr. Reeves next explained that in many cases customers in the first instance had 8-candle power lamps fixed in their houses; and afterwards either put in 16-candle power lamps or additional ones. When this was done in a certain group of houses attached to a transformer, the result was that the current was broken through an automatic fusing. As to the purchase question, he remarked that for years the electric lighting at Chelmsford did not pay. But now it was paying; and last year made a profit of about £1000. Messrs. Crompton and Co. had money locked up in the Lighting Company; and they wanted to put that money in their other concerns, where they could use it much more profitably. He had decided, with the sanction of his Directors, to invite other people to take the lighting concern off their hands—in fact, he had made arrangements, which were almost concluded, for placing the Lighting Company in other hands; but he would ask the Council, whether it was not in their interests to secure the lighting of the town for themselves. The lighting was now paying; they had 750 applications for 8-candle power lamps; and they were going to erect a new building, and extend their mains into Springfield. The capital was from £41,000 to £42,000; and the Town Council could now purchase the interests of the Company at cost price. If the Council, however, did not seize this opportunity, the concern would pass into other hands—a large Company being formed to take over a considerable number of undertakings in this country. The Council would then not be able to purchase the concern until 21 years had passed; and they would have to purchase at a valuation. Mr. Reeves was asked to reduce his statement to writing, when it will be considered by a Committee.

Incandescent Gas-Light v. Electricity.—We learn from the "Ironmonger" that the Wellington (N.Z.) Gas Company advertise a test made there a short time since to determine the relative cost of gas supplied through a Welsbach incandescent burner and electricity producing an exactly similar degree of illumination. "Several gentlemen holding important official positions in Wellington were present," says the advertisement; and the trial was fair and thorough. The result was startlingly in favour of gas. It took 66-candle power of electricity (a 50 and a 16 candle lamp) to equal in illuminating power a single Welsbach burner. During 24 hours, 4·27 units of electricity were consumed by the former, which at 10d. per unit made the cost of electricity 3s. 6¾d. By the Welsbach burner, 85·57 cubic feet of gas were burned, the cost at the current rate of 6s. 3d. per 1000 cubic feet being only 6¾d., or 3s.0¾d. in favour of gas. At the Grahamstown Exhibition, noticed in the "Journal" last week, the Manager of the South African Lighting Association is showing at the Company's stand that, with incandescent burners, gas costs one-tenth less than electricity for lighting.

METROPOLITAN WATER SUPPLY COMMISSION.

Forty-Fifth Day, Monday, Jan. 23.

(*Viscount* Llandaff, *Chairman*, *Sir* John E. Dorington, Bart., M.P. *Major-General* A. de Courcy Scott, R.E., *Right Hon.* J. W. Mellor, Q.C., M.P., *Mr.* A. de Bock Porter, C.B., *Mr.* H. W. Cripps, Q.C., and *Mr.* R. Lewis.)

The Commission sat at the Guildhall, Westminster.

The following are the Counsel engaged: Mr. Pope, Q.C., and Mr. Claude Baggallay, Q.C., for the New River and the Southwark and Vauxhall Water Companies; Mr. Littler, Q.C., and Mr. Lewis Coward for the Kent Water Company; Mr. Pember, Q.C., for the Lambeth, East London, Grand Junction, and West Middlesex Water Companies; Mr. Rickards for the Chelsea Water Company; Lord R. Cecil for the Hertfordshire County Council; Sir Joseph Leese, Q.C., M.P., for the Kent County Council and Kent Local Authorities; Mr. Balfour Browne, Q.C., and Mr. Freeman, Q.C., for the London County Council; Sir R. Nicholson for the Middlesex County Council; and Mr. Gabriel P. Goldney (Remembrancer) for the Corporation of the City of London.

Mr. Balfour Browne remarked that if anything he said the previous week was construed to mean that the County Council were not going to give Colonel Rathborne all the information they could, this was entirely erroneous. As a matter of fact, Sir A. Binnie was already in communication with Colonel Rathborne as to certain information that was wanted. The Chairman had asked witnesses to give an idea of what sort of stream the Thames would be below the lowest lock if only 100 million gallons a day flowed over Teddington Weir. Counsel handed in a diagram prepared by Mr. Deacon on the basis of a Thames Conservancy section of the river at a point 406 yards below Richmond Weir, which indicated the condition of the river at full tide, and when 100 and 200 million gallons respectively were flowing. It showed that Mr. Eaton's idea that any vessel customarily using that part of the river could float when the lower flow was passing, was entirely erroneous. When the flow was 100 million gallons, it appeared that the maximum depth was 3 feet. Then there was an available space of 20 feet with a depth of 1 ft. 9 in., 40 feet with a depth of 9 inches, and 60 feet with a depth of 4 inches. He did not want to go into this question of whether the deprivation of flood water would injure the Thames below Richmond Weir, though holding the opinion, and prepared to prove, that the taking away of the flood water would cause the silting up of the river. The matter was a little foreign to the inquiry.

The Chairman: It has a material bearing upon the cost of the reservoir scheme.

Mr. Balfour Browne agreed, because if the Companies were not allowed to take flood water, they could not give the additional supply they said they could obtain from the Thames.

Mr. Pember suggested that the whole matter might be dismissed, because if gone into at all it should be discussed fully, and not in this manner.

The Chairman: One result of this diagram appears to be that the difference between 100 and 200 million gallons is inconsiderable.

Mr. Balfour Browne said the maximum of the 200 million gallons was 10 inches higher than in the case of the 100 million gallons flow.

Mr. Littler: That is at the lowest moment of the ebb tide.

Mr. Balfour Browne: That is for from three to five hours.

Mr. Pember: Then there is the question of the water not being let down from Richmond Weir, which has to be considered; and the diagram is ten years old.

Mr. *C. E. Groves*, examined by the Chairman, said he was Chemist to the Thames Conservancy Board. In opening, he referred to the diagram just put in, which he remarked related to a time before Richmond Weir was in use, and therefore did not represent what would be the present state of the river. He had made a number of examinations of raw Thames water taken in the neighbourhood of the intakes of the Companies. There had been great improvement in the quality of the water since the passing of the Thames Conservancy Act of 1894. The amount of polluting matter had diminished to about two-thirds what it was prior to the passing of the Act; comparing the average of 1893 with that of 1897. Witness handed in a series of tables showing the results of his analyses, from which it appeared that the impurity in the samples taken in 1891-2 was 0·13 part per million parts, and in 1893-4 0·117; whereas in 1897 it was 0·094, and in 1898 0·091. From these tables the results for the month of May appeared to be almost uniformly bad. With regard to flood waters, samples of which were taken and tested in 1898, witness said they contained a certain amount of turbid matter, which it was impossible to separate. This turbid matter contained a very large proportion of the organic pollution; so that if they allowed it to settle the flood water would be very greatly purified. It had been stated that impurity collected in the soil and that the first flood washed it out; but the tables he had prepared showed that nothing of the kind happened. The result of ten samples taken from Oct. 20 to Oct. 29, 1898, gave an average of 0·110 part per million. The examination of samples daily during the flood from Nov. 24 to Nov. 29 showed that the highest amount of impurity was represented by 0·32, and the lowest by 0·25. The first day was better than the third; and the fourth, fifth, and sixth days exactly the same as the second. This was the result of examination when first received; but after being allowed to settle for nine days, there was a difference in the order. As the water settled, it carried down with it the organic impurities. After having settled for nine days, the water taken on the first day of the flood turned out better than that taken upon subsequent days. Witness also took samples daily of a flood from Dec. 6 to Dec. 11 last. These samples were clearer; and the amounts of albumenoid ammonia—the organic impurity—were (when received) 0·11, 0·11, 0·10, 0·10, 0·08 and 0·06 part per million respectively; the sample on the sixth day being considerably better than the average.

The Chairman: This is a good deal better than any of the averages when the river is not in flood?—It is a great deal better.

In further examination, witness handed in other figures of samples of flood waters taken from Dec. 28, 1898, to Jan. 4, 1899. The samples were each of half a gallon. He should think settlement would take place more rapidly in a large reservoir than in a half-gallon jar standing on a table, because in the former case there would not be change of temperature. When the flood was subsiding, the water was considerably better than the average water—due to its being largely rain, and containing no organic matter. The average impurity of the flood water during this last flood (after standing nine days) was 0·1.

The CHAIRMAN: In this organic impurity, what is the dangerous element?

Witness: I do not think it contains any dangerous element. The nitrites showed that the entire decomposition of the impure animal matter present was going on satisfactorily. Chemically, as distinct from bacterially, the organic impurities in the water are not dangerous to health. My examinations have not been directed to finding bacteria.

This organic impurity is not prejudicial to the water as a potable liquid?—It is not.

By Mr. CRIPPS: The effluents from the sewage farms provided most of the impurities in Thames water. If there were no effluents passing into the river, the water would be purer; but even then they could not stop the draining of the fields into the river. The pollution from vegetable matter was so small that they might neglect it.

Further examined: Flood waters from the very first hour of the flood might be taken with safety. He saw no advantage as regarded the purity of the water in letting floods go by. He thought it would be found that the flood waters of the Thames would give a better water than that taken not in times of flood. This would be so even with large quantities of spring water in the Thames, because spring water contained small quantities of impurity, while rain water contained practically none.

By Major-General SCOTT: The taking of flood water directly on to filters was more an engineering question. The engineers would not willingly choke their filters.

Witness (continuing) handed in a table showing the improvement the Thames Conservancy Board had wrought in the river; the samples dealt with having been taken directly from the effluents of sewage farms of various towns on the river. The result was to show that in many cases the effluent had been enormously purified; and the purification could, he thought, be increased. These sewage effluents were not dangerous at all, if properly conducted. The bacteria were the chief source of danger in the Thames; and in this connection he emphasized the necessity, with a view to eliminating pathogenic organisms, that sewage should pass over land before being discharged into streams. He thought the question of the flow over Teddington Weir might very well be left to the Thames Conservancy. Witness next handed in a table of a comparison between the number of deaths from typhoid in various large towns and London, to illustrate the fact that Thames water was one of the best known.

Cross-examined by Mr. BALFOUR BROWNE: He was not aware that large numbers of microbes were supplied to consumers of London water, and he had made no test to ascertain their number. His tests showed all the matter present.

Mr. *H. C. B. Bowles*, Governor of the New River Company, examined by the CHAIRMAN, referred briefly to the history of the undertaking. Until the year 1852, the Company charged their customers by agreement—so much per room. Then an Act was passed according to which the charge was upon annual value. In the Company's Act of 1852, the capital, after being gone into by Parliament, was fixed at £1,519,958, which sum included all the real estate of the Company except the Clerkenwell Estate. A proprietor in the Company would get income from both sources. The adventurers' and king's shares—of which there were 36 each—were real estate. In 1866, £500,000 of new share capital was raised, which was to rank *pari passu* with the then existing shares, but not to be considered as real estate. The total value of the 72 king's and adventurers' shares was represented by the £1,519,958. The Company at present had 164,000 supplies, 86 per cent. of which were constant. They had very few complaints, comparatively speaking; the number in 1897 totalling 685. But there was not a single case in which the Company were in fault. The water supplied was of the highest quality. The Company had works in hand which would enable them to go on supplying till 1931; and they had never put their district on a short supply. In the City of London, the charge of the Company was only about two-thirds of what their Act empowered them to levy; but as the bulk of the houses in the other parts of the district came under the cheapest rates, no reduction was made. Many of the consumers only paid 1d. a day for their water. As to the financial expediency, from the point of view of the water consumers or ratepayers, of purchasing the undertaking, witness did not see how either would be helped by it. Probably under a municipality there would be a larger staff at higher salaries; and at first they would not understand the working of the concern. He could not say how much of the capital of £1,500,000 represented the real estate. In the event of purchase, there would probably be a rate-in-aid, as at Manchester; and in the City, full charges would no doubt be levied. If the Company were to be purchased, he thought the arbitration should be under the Lands Clauses Act, seeing that they were a good going concern, with everything as favourable as it could be, and that they were paying a fair rate of interest. One reason why he desired the Lands Clauses Act, was because he thought there should be some compensation for compulsory sale. If the whole of the Metropolitan Companies were to be bought out, the Government were the only people who should effect the purchase and control the concerns, seeing how vast was the area and population of the Metropolis. Certainly the controlling body should be permanent, and not a changing one like a municipality.

By Mr. LEWIS: If a purchase took place, a proper basis would be income; but there would be something for future prospects. In the agreement for sale entered into with the late Mr. Smith, the Clerkenwell Estate was left out.

Major-General SCOTT: Is not the business of an arbitrator to so discount all future profits in the purchase price, that the purchaser would have nothing to look forward to in the way of future profits?

Mr. PEMBER: That is what it ought to be, no doubt.

The CHAIRMAN: Very well. He would have nothing to look forward to. He would have had it all down; then he would have to provide a sinking fund.

Major-General SCOTT: Then comes the question whether any saving can be made.

Witness said he believed the undertaking was carried on as economically as it could be. He did not think getting water from Staines through a long conduit was more expensive than would be the erection of more water-works in the Lea Valley. If it were necessary to go to Wales, he saw no reason why the Companies should not combine for the purpose. As to control, he pointed out that increased powers were given under the Act of 1897, and nothing further was needed. In reply to a suggestion that some of the capital ought to be written off as obsolete and unrepresented by works, witness said that when, in 1852, the capital was fixed at £1,500,000, this did not represent anything like the sum then invested in the concern. He had no objection to allowing the Water Examiner to enter the Company's works when he liked; and if the Commission recommended it, the Companies would not object to the information in the Examiner's report, which was now supplied by courtesy, being given as of right. Further questioned as to control, witness pointed out that if a consumer thought he was over-charged he could go to a magistrate, and not adopt the cumbrous method of going before the Railway Commissioners. No further control was needed in the way of applying an authority to guide and influence the Companies in going to the Thames or Wales or elsewhere in case further water were required. The Companies were bound under statutory authority to supply their consumers; and when they could obtain no more water from present sources they would go elsewhere. He did not see why Directors should recoil from going to Wales, because that step would mean a temporary reduction of dividends.

The CHAIRMAN: What do you say would happen to your Company if they failed in their statutory duties? How would they be the worse?

Witness: I cannot realize the idea.

The CHAIRMAN: I do not see that they would be a penny the worse if you were to drop your supplies altogether to-morrow.

Cross-examined by Mr. BALFOUR BROWNE: He saw no necessity for further control. He did not think the Company had any obsolete works. There was an area containing 237,000 people within the New River Company's district, but supplied by the East London Company; and he accepted as correct, if the rates were as stated by Counsel and the calculations were right, that the New River Company could have supplied those persons with water, and that the payment to the Company would have been £11,912 less than that to the East London Company. There was an agreement, dated 1815, between the two Companies that each was not to supply beyond a certain line.

Forty-Sixth Day—Tuesday, Jan. 24.

Mr. *Bowles*, in cross-examination by Lord R. CECIL, said the New River Company's original sources of supply were the Chadwell and Amwell springs. He undertook to furnish Counsel with information as to when they commenced taking water from the Lea. Questioned as to paragraph 180 of the report of Lord Balfour's Commission, in which the importance was referred to of keeping accurate observation of the effect of pumping water from the chalk, and as to whether some sort of control in regard to this matter was not necessary, he said the Company kept observations of their wells; but he did not see how it would be to the advantage of the public to make this information public. If it was thought proper to enforce the suggestion contained in the paragraph, no doubt Parliament would have brought in an Act to that effect. He was not afraid of publishing the results of the observations, but thought they were better in the hands of experts than of the public. Pressed as to whether at least the county of Hertfordshire should not be supplied with the facts, witness said it was better that the Company should be left to manage their own affairs. The facts, to others than experts, would be misleading. The Company when they sank wells did it under their Charter, defraying the cost out of capital.

The CHAIRMAN and several members of the Commission said they did not see the force of the witness's objection to supply the information; but witness adhered to his opinion.

Mr. *James Searle*, Secretary to the New River Company, handed in a number of tables relating to the financial position of the Company. The capital expended was £3,713,482, which represented the outlay prior to 1852, the new shares, and three classes of debenture stock. On the Clerkenwell Estate, there was a perpetual rent charge of £362 a year. The charge on the Company of £500 a year was called the King's Clogg, and was a totally different thing. It was really a deduction from the profits of holders of king's shares. The profit on each king's share was £2760 per annum. The Clerkenwell Estate was the only real estate of the Company outside the water assets. The highest price realized in 1898 for an adventurers' share was £125,352; and for a king's share, £115,500. The market price of the Company's new shares was between £440 and £445. The lowest price paid for an adventurers' share in the last ten years was about £86,000, in 1887. At present prices the yield on the shares was nearly 3 per cent. As far as he knew there was no agreement between the City Corporation and the Company with regard to the charges; it was a matter of bargain. Prior to Torrens's Act, the Company used to take their own valuation without reference to the rate-book; but now the charge was fixed with some regard to the annual value.

Cross-examined by Mr. FREEMAN: Allowances similar to those made in the City were made outside in respect of premises which had exceptional value for business occupation. The meter supplies yielded about £125,000 a year, in addition to which there would be a number of agreed amounts for non-metered supplies, but which were non-domestic, amounting to £30,000 or £40,000 a year.

By the CHAIRMAN: The Company granted indulgences to people outside the City.

The CHAIRMAN: Would it be possible for the Company to demand their full charges?

Witness: It would create a great deal of opposition and angry feeling; but the Company could face this, if they thought it worth while.

Do you look upon this reserved statutory power as an asset of the Company?—Yes.

Which you would use before an arbitrator?—Certainly; I should imagine so.

Although the feeling against it would be so strong that, for the sake of your own shareholders, you have not charged it since 1852?—We did not regard it in that light.

By Mr. LEWIS: If the Company charged full rates, there would be a very substantial increase in their profits.

Mr. *Joseph Francis*, Engineer to the New River Company, examined by the CHAIRMAN, said when before Lord Balfour's Commission he stated that 34 million gallons a day was desirable from the Chadwell spring and other wells of the Company. They had pumping capacity to this extent, but only by working the pumps night and day. As time went on, they found the necessity of duplicating the machinery. They must strike off 10 million gallons a day for ordinary stoppages.

The CHAIRMAN: The fact is that there is only available for the consumer, with the existing pumping machinery, 24 million gallons?

Witness: Yes.

What amount from the wells that existed in 1892 can you get up and deliver to the consumers?—We can obtain 30 (say, 28) million gallons a day.

Are you getting it now?—Not at the present moment, because we do not need it. In the summer we were.

What is the largest amount you have got?—About 29 million gallons a day. That was pumping day and night.

Examination continued: He gave the Balfour Commission a forecast of the requirements of the New River Company's district; but he now pointed out that the problem then presented as to the distant future was perfectly novel. Hitherto the Companies had found it sufficient to have in hand works to provide for ten or fifteen years ahead; but they had not had regard to the cost of supplying, and the growth of London, forty years ahead. The forecast laid before the Balfour Commission was that there would be a yearly increase which would raise the probable average daily consumption at the end of forty years to a total of 47¼ million gallons. Witness gave a different forecast in 1896, when before a Committee of Parliament. Just previously there had been a very great frost, which impressed upon them the necessity of adopting a higher estimate of the future consumption than in 1892; and he estimated, he believed, that in twenty years they would require 63 million gallons as the average daily supply throughout the year.

The CHAIRMAN remarked that the figure had been given as 77,921,000 gallons.

Witness said that was not his figure. The 63 million gallons was the quantity they were to provide. In 1892, the Company were certainly too low in their forecast. They imagined that the increase in the number of supplies would go on at the same rate as for a certain number of years previously, and then increased the quantity of water in proportion—allowing a consumption of 35 gallons per head daily. The number of supplies since that time had increased as they had expected; but the quantity used per head in times of maximum consumption and drought had increased beyond expectation. The average consumption throughout their district last year was 31½ gallons per head per day; the maximum he had not worked out. With reference to a statement made on a previous occasion, he said each year an additional million gallons or thereabouts was required to provide for the maximum demands. Each year the addition to the average was something under 750,000 gallons. This increase, he thought, would be maintained for a few years; but it would be gradually reduced, because the district of the Company in which expansion could occur was limited. The Company's estimate provided for the filling up of the district; so that it was immaterial whether forty years or a longer period was taken. To meet these future requirements, he estimated that, apart from the capital of £1,000,000 provided for the construction of works to establish communication with the Staines reservoirs aqueducts, from £10,000 to £12,000 per annum would be required to extend mains to serve new houses, and a capital sum of £260,000 for augmentation of power and means of supply. These figures included no part of the capital which the Staines Reservoirs Joint Committee had statutory power to raise. The forecast was based, as had been requested by the Commission, upon the assumption that the increase of population during the next forty years would be the same as that which prevailed from 1881 to 1891—viz., in the case of the New River Company, at the rate of 1·0951 per cent. per annum; the average figure of increase over the whole of London for the same period being 1·68458 per cent.

The CHAIRMAN: Can you give me the total capital expenditure covered by your forecast, including everything?

Mr. PEMBER: I have added up all the items on witness's statement, and they come to £2,173,500, including Staines.

Witness (continuing) said in periods of frost the extra consumption had reached 8 or 10 million gallons per day; and the consequent extra cost was very great. He quite admitted that, by pumping, every spring or well within the cone of depression of the well where the pumping occurred was depleted. As to keeping observation of the effects of pumping and publishing them, he held that this was objectionable, because however much information as to the results was communicated, they could not communicate all. To know all the Company knew, the people desiring the information must stay at the works; for from the few undoubted facts that were supplied them they might easily draw wrong inferences. An outsider would be misled by the information. The observations that were of most value in their daily work were what they saw and heard—the daily and hourly variations of the wells, &c.—the details of which, if written, would be so voluminous that they would be valueless. In 1898, the Lea discharged less water than in previous years; but this was due to deficiency of rainfall in preceding years, and especially in the previous winter, and to the failure of the upper springs. They were able occasionally to say what were the rest-levels in their wells; but it was more difficult now than formerly, owing to the pumping being greater. There was no evidence whatever that the rest-level of their wells in the chalk in Herts had been lowered in the last twenty years. In the wells nearer London, in the tertiaries, they found a progressive sinking of the level of about a foot per annum. This, however, did not affect the yield. The suggested partition of the New River Company's district at the boundaries of London, Middlesex, and Hertford he regarded as most unsuitable, because the positions of the boundaries were determined by certain altogether different considerations from those of a water concern.

Cross-examined by Mr. FREEMAN: He should almost think the New River Company could get all the water they required from the Lea Valley. Their mains were laid at an average depth of 3 feet; and they had only to a slight extent been affected by frost. There would be no objection to handing the results of the Company's pumpings to a friendly expert; but there might be in giving them to a hostile one.

Cross-examined by Lord R. CECIL: With the expenditure contemplated, the Company would, among other things, probably pump two or three million gallons a day more from their existing wells, besides providing for actually pumping the 34 million gallons available. There was a depression of the water under London; and the northernmost wells at which the depression was felt was at Enfield. In the open chalk, this depression was not noticed at all. The explanation was that there was a stream of water passing on from the upper part of the chalk to the lower levels. This water did not all flow into the depression under London, because the weight of the clay upon the chalk only allowed it to pass at a certain rate, but not fast enough to make up for the withdrawal of water through the numerous pumping-stations in the basin of the London clay. The quantity pumped in this way had been estimated at 12 million gallons a day. The flow was considerably greater than this, because all the water passing under London was not taken. He did not think the average discharge of the Lea had sunk out of all relation to the rainfall in the last sixteen years. He did not see why there should be any control of the Companies as to the quantity of water they drew from their wells; those who were responsible for providing the water should manage their own business concerns. He saw no necessity for a general enactment preventing Companies from sinking wells unless those wells were specified in a Special Act. Witness was then pressed at some length with regard to his objections to giving the results of pumping; but he adhered to his opinion that it was not desirable. There was no reason for withholding the information from an expert who had time and ability to measure the details and go into the whole question; but to give a few isolated facts, say, to a County Council, would not be for their good or anyone else's.

Lord R. CECIL, in reply to Mr. CRIPPS, said his point was that by excessive pumping the Companies would injure other people—not necessarily their property, but that they would take water which would perhaps bear up water that would otherwise flow down their stream.

The CHAIRMAN: You want to alter the law of underground water as against Water Companies.

Lord R. CECIL: I do.

Mr. MELLOR: You are complaining of an injury without a remedy at law.

Lord R. CECIL: I am.

The CHAIRMAN (to witness): You contend, as I understand, that by your pumping you are not draining your neighbours' wells, and not lowering the Lea?

Witness: We are certainly not lowering the Lea, and not injuring our neighbours' wells, except in the cone of depression.

The CHAIRMAN: There are facts in connection with your pumping which lead people to think you are.

Witness replied that in dry weather wells sank, and people attributed this fact to the pumping of the Company.

In further cross examination, witness stated that it was the friction of the water passing through the chalk which had the effect of preventing the lowering of the water to any great distance. In an open stream, if they pumped the water out the effect might extend a great distance, because the friction at the side was small; whereas in the chalk the friction of the water passing through was so great that it soon died out.

The CHAIRMAN: I understand you to put it in this way: If you could place pumping machinery into the Thames, enough to pump out every drop of water coming (say) to Staines, so that there is nothing in it, the quantity above Staines would be the same?

Witness: That is so.

By Sir J. DORINGTON: The area of a cone of depression seldom extended beyond a quarter of a mile; but it was not prudent to name any definite distance.

Cross-examination resumed: The water from the chalk under London was being pumped quicker than it came in; the flow in the chalk beneath London was very slow.

Lord R. CECIL: Does it not follow that, the natural path from the chalk of Hertfordshire to the sea being under the London clay, there must be a restricted flow under London?

Witness: All the water gets away.

I submit that a very small quantity comes under the clay, and a large quantity overflows into the streams?—Oh, no! We know that all round the Essex coast there is a constant flow of water, which is proved by the fact that wells sunk within a short distance—in some cases a considerable distance—of the shore, give brackish water. This indicates that there is communication with the sea; it proves that the fresh water communicates with the sea, and that the sea flows in.

How far is the farthest of your brackish wells from the sea coast?—I think there is one 17 miles away.

Lord R. CECIL said this latter fact seemed to him to be of immense importance. In view, however, of a remark from the Chairman that it was only because he knew Hertford was very tender on this point that he had permitted the cross-examination to proceed so far, Counsel did not pursue the subject.

The Commission then adjourned.

The forty-seventh sitting of the Commission was held yesterday at the Guildhall, Westminster—Lord Llandaff presiding. Mr. Balfour Browne, in opening the proceedings, said he understood from the evidence given by Mr. Groves last week that this gentleman was in some sense appearing for the Thames Conservancy. He understood now, however, that Mr. Groves did not claim to represent that body. Mr. Pope agreed. Mr. Balfour Browne said he was misled. Sir A. Binnie was then called and examined by the Chairman with reference to the drought of last year in connection with the flow of water in the Thames and Lea.

Reduced Water-Rates at Johannesburg.—It is stated that the Johannesburg Water Company have decided to impose in future a minimum charge of 10s. per 1000 gallons or less. Hitherto the minimum charge has been 20s. per month for 2000 gallons.

CHELSEA WATER-WORKS COMPANY.

A Special General Meeting of this Company was held at the Offices, Commercial Road, Pimlico, last Thursday—Mr. F. S. Clayton presiding—for the purpose of considering, and, if thought fit, of approving, a Bill proposed to be introduced to Parliament in the ensuing session entitled "A Bill for Improving and Facilitating Intercommunication between the Mains and Works of the Metropolitan Water Companies."

The Secretary (Mr. G. H. Gill) having read the notice convening the meeting,

The Governor stated that it had been called in compliance with the Standing Orders of Parliament. He then asked the Solicitor to read and explain the clauses of the Bill.

The Solicitor (Mr. Percy Hollams) said that he would read the whole Bill, if it were thought desirable to do so; but as a rule it was found more advisable merely to explain shortly the main provisions. The Bill was to provide for the difficulties which had arisen, and which were likely to arise, in consequence of drought or other deficiencies of water; and it provided for the Companies being able, with the permission of the Local Government Board, to carry out such works as would, in times of drought or other occasions of accident or emergency causing a deficiency, enable them to give the additional supply required. The Bill also provided—with the leave, again, of the Local Government Board—for their taking an additional amount of water, should it be found necessary to do so, over and above the quantity which they could at present drew from the Thames and its tributaries. Owing to the drought last year, something was then done—not by the Chelsea Company, but by some Companies—and the Bill contained a clause for making this proceeding good, as if the measure had then been in force as an Act. Provision was also made for the mode of paying for the works by debentures, which would be issued in a way prescribed by the Act; and the payment would be by way of interest to be agreed upon and settled later, while the mode of meeting the interest would be according to the rentals of the different Companies. The proposed measure was entirely in accordance with the first report of the Royal Commissioners. The Bill itself was prepared a month or six weeks ago, before the report was made; and therefore the Companies might take credit to themselves for having done exactly what apparently met the views and wishes of the Royal Commissioners.

The Governor then proposed a resolution approving the Bill, "subject to such additions, alterations, and variations as Parliament may think fit to make therein."

The Deputy-Governor (Mr. Jackson Hunt) seconded the motion; and it was carried unanimously.

The proceedings terminated with a vote of thanks to the Directors.

MALDON WATER-WORKS ARBITRATION.

Friday, Jan. 20.

(*Before Mr.* G. H. Hill, *Arbitrator.*)

This was an arbitration, held at the Westminster Palace Hotel, to fix the price to be paid by the Corporation of Maldon, Essex, for the compulsory acquisition of the undertaking of the Maldon Water Company.

Mr. C. A. Cripps, Q.C., M.P., represented the Company; Mr. Shiress Will, Q.C., appeared for the Corporation.

Mr. Cripps, in opening, said the purchase was made under the terms of an agreement contained in the Maldon Water Act of 1898, which agreement was the result of negotiations between the Corporation and the Company. It provided for the sale of the net income and all rights and privileges of the Company, after allowing for mortgages, charges, liens, encumbrances, &c., to the Corporation. The machinery to be employed was the Lands Clauses Act, which was generally the case, as this Act provided for the widest possible compensation being given, and for the 10 per cent. for compulsory sale being allowed. The sale was to be regarded as compulsory. It was to take effect as from Dec. 31, 1897; and the date of completion was to be Dec. 31, 1898, or such earlier date as might be agreed upon. The costs and charges of the arbitration, those incidental to the winding up and dissolution of the Company, and those in connection with obtaining the Act of Parliament, were also to be borne by the Corporation. The Company was formed in 1862, and had no parliamentary powers till the Act of 1898 was passed. The possession of parliamentary powers affected the security of the income, and therefore was also of importance in connection with the number of years' purchase. Though the Company was only a limited concern, practically for all purposes they had the rights of monopolists; there being really no alternative source of supply for the district. Formerly a distinct difference was made between the number of years' purchase allowed for a limited and a parliamentary company; but with an undertaking having virtually a monopoly, he held the number of years' purchase should be decided on that basis, and without regard to whether the company was in one form or the other. In 1897, the Company gave notice to proceed, first by Provisional Order and then by Bill, to obtain what eventuated in the Maldon Water Act of 1898. The Corporation intimated their intention of opposing, if the Company did not agree to sell, with the result that the agreement for this purpose was entered into. There was no contest in Parliament. In valuing the undertaking, the last complete year when the Company were working as an independent concern—viz., 1897—was taken. The trading profits for that year were £611 7s. 5d. This included a sum of £18 5s. for Directors' fees; and the only substantial contest on the accounts, he believed, would be as to whether this sum should be deducted or not. He thought it was in the nature of a gratuity rather than of a payment for management. Deducting £226 for debenture interest from the £611 7s. 5d., left the net profit for capitalization as £385 7s. 5d. Mr. Bryan, the chief witness for the Company, said it was fair to capitalize the profit on the 3 per cent. table, having regard to the stability of the undertaking. This worked out to £12,845 13s. 10d. Prospective value arose from the fact that there were 194 houses in the district not at present supplied by the Company with water, and which must have become connected with the mains, if the Company had continued. On the average of other similar property, the gross revenue derivable from these houses would be £161 13s. 4d., which, allowing 40 per cent. for working expenses, would leave a net profit of £97. These new connections were taken as extending over five years, which gave an annual increment of £19 8s. This capitalized and discounted on the 3 per cent. table, gave a sum of £2961 13s. 4d., which, *plus* the £12,845 13s. 10d., made a total of £15,807 7s. 2d. Adding the usual 10 per cent., increased the figure to £17,388 1s. 10d. The Act provided that the arbitrator should not in his valuation include any extra percentage for compulsory sale on so much of the compensation (if any) as might be represented, among other things, by mortgages. The Company, therefore, in making a claim in respect of their mortgage debt, did not add the 10 per cent. The mortgage debentures of the Company were issued at 4 per cent., and would fall in in two years. The Company claimed that they could re-issue them at 3 per cent., which would effect a saving of £56 10s. a year. This sum, deferred for the period on the 3 per cent. table, brought out an amount of £1673 6s. 8d., which, added to the £17,388 1s. 10d., made £19,061 8s. 6d. From this they deducted £1000 for expenses necessary to enable the Company to earn their income, leaving £18,061 8s. 6d. as the value of the concern. In conclusion, the learned Counsel mentioned, not as the basis of a specific claim, but to show the strength of the Company's position, that under their Act they had powers of charging which, if exercised, would increase the present income by £78 7s. 8d. per annum.

Mr. *W. B. Bryan*, Engineer to the East London Water Company, examined by Mr. Cripps, said the undertaking of the Company comprised two pumping-stations, a covered reservoir, land for a proposed water-tower, and all the usual appliances for distribution. The principal pumping-station was in Spital Road, where there were two deep wells—old and new. The old well was 5 feet in diameter and 235 feet deep; and attached to it was a set of nearly new three-throw pumps, driven by a horizontal high-pressure engine, with a cylinder of 12 inches diameter, and 20-inch stroke. The new well was 6 feet in diameter and 200 feet deep, with a borehole running down a further 50 feet. The pumps were slightly larger than the others. The pumping gear was quite satisfactory. There was very good storage for coal and other purposes. The water was pumped over a stand-pipe 46 feet high; and there was also a covered reservoir at the base, which held 80,000 gallons. The well was at nearly the highest part of Maldon, so that the greater portion of the town was supplied by gravitation. The Wantz Mill, the second pumping-station, had two wells. One was 8 feet in diameter and 60 feet deep, below which there was a 4 or 5 inch boring to a further depth of 200 feet. The other was 4 feet in diameter and 60 feet deep. A 4-inch tube connected these two wells. At this station there was a set of small three-throw pumps, 4 inches in diameter and 10-inch stroke, driven by a horizontal engine. The machinery was used four or five hours a day; and the water, as at the other station, was pumped over a stand-pipe. The Wantz Mill station was about 60 feet above Ordnance datum, and about 50 feet below the Spital Road station. The town was very steep in parts; one portion being 135 feet above Ordnance datum. The town was divided into zones; and at different periods of the day, the Company supplied various parts of the district.

The Arbitrator: Have you lay-by power in case of one of the engines breaking down?

Witness: We have at the Spital Road station two separate wells, with two absolutely separate pumping plants.

In further examination, witness handed in diagrams giving the results of a three days' trial of the wells made in December, in the presence of representatives of both sides. By their Act, the Company were not required to give a constant supply; and, as a fact, it was not constant. The area of supply was the municipal borough of Maldon. The houses actually connected numbered 1186. When the Corporation had the undertaking, they could compel the houses that were not already satisfactorily supplied to take water, and thus add to the income. From witness's knowledge of the locality, he should also say the prospects of more buildings being erected were greater than ever before. The population in 1891 was 5397, and the total number of inhabited houses 1249, which worked out to about 4·32 per house. Therefore in 1186 houses there would be 5123 people taking water. In 1898, as against 1897, there was an increase in the number of houses supplied of 73. Witness was then taken in detail through the figures of his valuation, which were those mentioned by Counsel in opening. He defended his figure of 33¼ years' purchase, on the ground that it was, with good water companies having a well-secured income, invariably used. There was not really very much difference between a statutory and a non-statutory company; there was no risk of the income falling off. With regard to the expenditure necessary to earn the revenue, he said it was what was estimated when the Company's Bill was before Parliament. These estimates included the erection of the water-tower, the connections to the water-tower, and certain improvements at the pumping-stations which would effect very great economy in coal consumption. This expenditure was necessary to earn the prospective, not the existing, income; and it was therefore charged against prospective profits. Assuming the £78 7s. 8d.—the sum which the Company could increase their income by if they charged according to the scale in their Act—was being produced, it would add another £2612 15s. 6d. to the value of the undertaking,

Cross-examined by Mr. Shiress Will: The Company had about one day's storage capacity, which was usual with a pumping supply. Roughly, the Company pumped during the day and rested at night—a very satisfactory state of things. At Wantz Mill there was no duplicate machinery. He knew of no complaint that the supply had been insufficient. In the Company's Bill, as deposited in Parliament, witness estimated that the new works the Company required would cost about £7000; and he now promised to furnish details of these works later on. The water-tower, which was most needed, would cost about £1000, exclusive of land, and would have a capacity of some 40,000 gallons. The consumption per head per day at Maldon was, as nearly as he could make out, about 18 gallons; but he might have taken a low year. Most of the unsupplied houses could be supplied from existing mains. He could not state the cost of mains to supply houses which could not be supplied from existing mains. Witness had heard that during last summer the Company asked the Corporation not to water the roads, because there might be a deficiency; but in no case was there a deficiency in the wells. Twelve gallons a head daily would

be sufficient for a town like Maldon. At Chesterfield the consumption was 11 gallons, and at Nottingham 12 gallons. The trade supply at Maldon only amounted to £38 a year. In a place where a company had practically a monopoly, there was little difference between the position of a statutory or non-statutory concern. Though the Company had been in existence 36 years, and had not yet succeeded in supplying all the houses, he held he was justified in assuming they would be able to do so in the next five years. He agreed that the general allowance of 10 per cent. included prospective value to a certain extent. With regard to the claim as to the conversion of debentures, witness said the debentures were issued long since, but were re-issued three years ago, when the interest was reduced from 5 to 4 per cent. He did not agree that 4 per cent. was the lowest figure at which they could have borrowed then; they were very easy-going about it. Similar companies to the Maldon were issuing debentures at 3 per cent. In one case, a company had borrowed at this rate though they had scarcely earned a dividend on their ordinary capital.

Re-examined by Mr. Bonnor Maurice (of Messrs. Bircham and Co., in the absence of Mr. Cripps): It was not necessary at present to duplicate the machinery at Wantz Mill. The £1000 witness allowed in his estimates was merely the expenditure requisite to maintain the increased profits. Nothing need be spent to maintain the existing profits. The water-tower would be a great advantage; but it was not necessary to maintain the present supply. It saved a great deal if they could pump at the same rate into an elevated tank, and so keep up the supply without the engines being run quicker or slower to follow the fluctuations in the demand.

By the Arbitrator: The engines had worked on an average 76 hours a week.

Some conversation passed as to a desire by the Corporation that they should be allowed to test the mains; and eventually it was left to the Arbitrator to decide what tests should be allowed.

Mr. *J. Rogers*, the Secretary of the Company, examined by Mr. Bonnor Maurice, said there were now 1389 houses in Maldon—140 more than in 1891—of which 1186 took water from the Company; leaving 203 not supplied. The population was 5723, against 5397 in 1891. The water-charges for 1897 were £988 17s. 11½d., and in 1898 £1016 18s. 10d.—an increase of £28 0s. 11d. Last summer, despite the exceptional drought, there was no deficiency in the supply. There had been a number of complaints from consumers; but on investigation they were found to be almost invariably due to the defective fittings. The supply for street-watering purposes had been stopped—not that for flushing the sewers. The Corporation had recently put in several flushing tanks. They were not supplied at first; but they were now. Practically, there were no other deep wells in Maldon except those of the Company. There were two other wells in the town; but they were both unfit for use. One, the Cromwell Spring, ran dry last summer. Witness also gave evidence as to the development in the way of building that was proceeding in the town.

In cross-examination, witness agreed that the Company wrote to the Corporation on Aug. 4, 1898, that they could not undertake to fill the recently constructed flushing tank. This was the very section which affected the high services for which in particular they wanted the water-tower. In fact, the Company did not care to undertake to supply these tanks until after the dry season. There were 25,056 feet of mains; but he denied that they were continually needing repair. Some of the mains were owned by private individuals. Witness maintained that the water supply was sufficient to cope with an outbreak of fire. The houses not at present supplied by the Company, and which could not be supplied from existing mains, numbered perhaps 70. Only half a mile of extra main would be needed to supply them. The Company charged the Corporation 25s. a day for street watering, which was done by two carts. This might work out to about 2s. 6d. or 3s. per 1000 gallons. Counsel then put to witness a number of cases in which complaint was made of the water supply; but he maintained in general that the difficulty was due to defective fittings. In the case of an iron-works, he said they unexpectedly filled a 2000 gallon boiler without giving notice, as it had been understood they would do if they required an unusual supply.

Re-examined: The cost of half a mile of main would be about £120. The restriction of the use of water last summer for street watering was only a precautionary measure, and not really necessary.

Mr. *T. E. Bland*, Chairman of the Company, gave evidence as to the land-developing business in the town having attained the dimensions almost of a boom. The boom began within the past twelve months. He confirmed the previous witness as to the complaints being entirely due to the fittings.

Mr. *Henry J. Hudson*, carman and contractor, of Maldon, who was employed to carry water from the Cromwell Spring last summer, said the spring was practically dry. He wanted the water from the spring to supply people who were not taking water from the Company.

Mr. *R. Blaxall*, a Town Councillor, and a Director of the Company, said that during July, August, and September last the Cromwell Spring was very short. He had drunk the water for fifty years, and had known the well fail scores of times.

Mr. *Richard Turner* said he lived on a hill at Maldon, above some of the places regarding which complaints as to the water supply had been suggested. He had never had to complain of shortness of supply through the Company's fault.

Mr. Cripps put in tables as to the Company's accounts, which had been practically agreed, and said that, subject perhaps to some minor matters, this closed his case.

The following witnesses were then called for the Corporation.

Mr. *Hicks*, an ironmonger of High Street, Maldon, said he lived next door to his own business premises, with his father, whose house was supplied by the Company. The house had two tanks—one slightly higher than the other—on the second floor. Last summer they had hardly any water in the two tanks. For days in succession there was a total failure. At other times they had perhaps 20 gallons a day. During the summer they were never able to get the tanks full. The water was only on one hour in the twenty-four.

Cross-examined by Mr. Cripps: His father made complaints to the Company.

Mr. Cripps said the Company had not received them.

Further questioned as to whether the fittings were not faulty, witness said the water only came in small quantities. He had tried to fill one tank by shutting the other off, but without success.

Dr. *Facey*, a resident at Maldon, said he had two tanks on the roof of his house; one, he was told, of about 100 gallons and the other of about 50 gallons capacity. He had had an unsatisfactory supply from the Company for two or three years; but not one about which he felt it necessary to make very great complaint, until 1898, when the trouble reached an acute stage. On Aug. 1, there was no water in the house from 3 p.m. till next day, on Aug. 2 from 3 to 7.15 p.m., on Aug. 6 from 2.30 till next day, on Aug. 12 from 11 a.m. till 1 p.m. and none in the afternoon, on Aug. 13 from 6.45 p.m. till next day, and on Sept. 3 and 5 no water from morning till night. He explained that he took notes at irregular periods owing to his profession taking him away from home a great deal. There were many other occasions besides those mentioned when the supply was deficient. He had been well supplied since September. He had repeatedly made complaint to the Secretary.

Cross-examined by Mr. Cripps: There were five adults and two children in his house. He did not think the capacity of the tanks was small for this number of persons.

Saturday, Jan. 21.

In the course of conversation between Counsel,

Mr. Cripps intimated that, in order to shorten the inquiry, he was willing to admit that in droughty times the people had complained as to the water supply.

Mr. Shiress Will therefore said he would only call one or two more witnesses with regard to this matter.

It was also agreed that, for the purpose of testing the mains of the Company, representatives of each side should visit Maldon, and open some of them, under the superintendence of a gentleman from the office of the Arbitrator.

Mr. *Bryan*, re-called, explained how his estimate of £1000 for the works the Company had to undertake came to be £7000 in the Bill as deposited before Parliament. After consultation with Counsel, it was considered to be necessary that the existing works at Spital Road and Wantz Mill, shown on the deposited plan, should be included in the estimate. His estimate of £1000 for the new works had therefore to be increased to £7000 to include what was shown on the deposited plans.

Mr. *W. Shepherd*, landlord of the Warkwick Arms, Maldon, and Mr. *A. W. Freeman*, an articled clerk to the Town Clerk of Maldon, gave further evidence as to shortness of supply. The latter witness said he did not think the fittings were defective, or that the pipes were corroded, because one day there was a full supply of water and the next day there was not.

Mr. *E. W. Drew*, of Messrs. Alfred Lass, Wood, and Co., handed in some tables relating to the accounts of the Company. He stated that the share capital was £2050 and the debenture capital £5650—a total of £7700. Five per cent. was paid on the debentures originally; but they had been subsequently reduced to 4 per cent., though the books did not show when. The dividend paid ranged from 2½ to 4½ per cent. till 1896, when it was 5 per cent. In 1897, it was 10 per cent.

Cross-examined: There was no difference between the two sides as to the profit for 1897, except as to the Directors' fees of £18 5s. Questioned as to whether the expenditure in maintaining the works had not been very high, witness said the percentage on gross income of the total cost of maintenance and management was 47·09 in 1894, 57·7 in 1895, 52·59 in 1896, and 48·52 in 1897. With the London Companies, he believed, the corresponding figure was about 32 per cent. The increase in the net water-rental in 1897 over 1887 was 2·63 per cent. per annum compound; and the increase, though not large, was fairly continuous.

Mr. *G. R. Strachan* said he had examined the works of the Company. A very good feature was the fact that at the Spital Road station they had two wells, two complete sets of pumping plant, a covered reservoir, and 200 feet of clay between the surface and the Thanet sands from which the water was pumped—the latter being a security in regard to the purity. The Wantz Mill works were of a very indifferent character; there being only one engine, though there were two sets of pumps. He produced a diagram giving the results of a three days' test of the yield of the Spital Road wells in December last. He wished to have a three days' continuous test; but the Company objected. The first day the pumping started at 7.30 a.m., and went on till 12.30 at night; the quantity pumped being 58,412 gallons. The water, however, did not rise during the night to its level when they started; and the inference he drew was that in those hours they exceeded the yield of the well. He submitted that the diagrams showed the fair yield of the well in 24 hours. He thought there must be more water in the well than the quantity stated, because if the pumping had been continuous at the lower levels the probabilities were that they would have got more. But as the Company worked, it was necessary to rest at night to store up the water; so that though the water was there it was not available. He held therefore that the minimum yield was even less than 54,000 gallons. The test took place in December after the rains had come. If he had tested in October, he should not have expected to obtain so much. He should place the minimum yield of this well at from 40,000 to 42,000 gallons a day at the driest period of the year. There was no test of the Wantz Mill station; but he was informed by the Secretary that they pumped it out in four hours. He estimated the yield at about 8000 gallons a day; making the total of the two stations about 50,000 gallons a day. As, however, the data on which he arrived at this conclusion were not reliable, he proposed to call it 60,000 gallons a day. Mr. Bryán had put the supply on the average at about 18 gallons per head per day; but witness challenged this entirely, for the measure of the capacity of the Company was the absolute minimum yield of the worst day. The fact that the Company had enough water in December was no satisfaction to the people for shortness in July; and the Company had only one day's storage. He calculated that the consumers numbered 4788 on Dec. 31, 1897, which, with a total supply of 60,000 gallons, meant 12½ gallons per head per day. This estimate was on the supposition that the domestic consumers had the whole of the water, and that none was used for trade. In witness's opinion this was not sufficient for the town; and so there was no prospective value. There were some disadvantages connected with the Spital Road station. For instance, a supply from Thanet sands was always liable to blows of sand, which caused great trouble. Then the fact of there being two separate stations for the supply of the town was disadvantageous; and the pressure was at certain parts of necessity very poor. He challenged the condition of the mains, and the fact of there being only a single

plant at Wantz Mill. Then there were mains laid in public roads, on which private individuals had a right to levy a toll of a pound a house before connections could be made. The Company ought to buy up the rights of the people on these mains, or make an allowance for them. Having regard to the condition of the works, he considered the concern a second-class one. The ordinary principles of valuing a water undertaking were not, he thought, applicable in this case. The financial position of the concern was very anomalous; for while the share capital was £2050, the debentures were nearly three times as much. The Corporation had to take over the debentures, and pay out the £2050 share capital; and to do this Mr. Bryan asked over £18,000. The gross income of the Company (about £1100) was fairly even; but the divisible profits fluctuated in a most extraordinary manner—being £295 in 1894, £173 in 1895, £229 in 1896, and £349 in 1897. Witness contended, therefore, that they could not be stable. The profits for 1895 were half those of 1897; and those of 1897—the top of the crest—were what Mr. Bryan had capitalized. The profit for 1897 was 17 or 18 per cent. on the capital. The same instability was apparent in the expenditure on works and mains. The result was that he was quite unable to fix the maintainable income; but whatever it was, it was not well secured. The Company was a non-statutory one; and if they divided 18 per cent., they would be pulled up by the Local Authority refusing them permission to extend their pipes. His valuation was based on the assumption that the stock of a statutory company with a well-secured income, paying the maximum dividend, was worth from £300 to £330. Under no circumstances could this Company be considered the equal of the highest statutory concerns. Witness suggested that if they were given £200 for every £100 of capital, they would be well paid. In this way, the valuation of the share capital would be only £4100, to which, by instructions, he added 10 per cent.—viz., £410. From this, however, there would have to be a deduction for defective mains.

Mr. Cripps (in cross-examination): Your figure will be 10 or 11 years' purchase of what is admitted to be our income in 1897. Have you ever heard a suggestion of a company being bought up at 10 or 11 years' purchase of their income?

Witness: No; and, on the other hand, I have never met with a company in this condition, nor one with stock worth £900. The large proportion of debentures shows that the Company is unsound financially.

Nothing is more economical than to raise as much money as you possibly can on debentures, so long as the soundness of your concern enables you to do it?—Agreed.

Therefore the large number of debentures indicates the soundness of the undertaking?—I assent to that in general. In this case, however, the Company have found all their new capital by debentures instead of by share capital; and this has thrown a profit on the shares of 18, 20, or 25 per cent. This would be good finance for a trading concern—a grocer's or publican's business—but in a case like the present, dividends swollen in this way indicate that they are not well-secured, and cannot be maintained. If the Company paid such large dividends, the Corporation would intervene as I have suggested.

Witness was then questioned as to the fluctuations in the accounts; and he maintained that they were so great as to prevent him saying what the available income of the Company was. With regard to the yield of the wells, if at the trial they had pumped through the 24 hours they would certainly have got more water. The fact that on the first day they pumped out 58,000 gallons, and that the water did not rise to the level at which they started, was an absolute sign that they were drawing from the well more than the surrounding strata was yielding. He was pressed to admit that by continuous pumping, and at a lower depth, the supply could be increased; but he denied that this would be so, except perhaps to a small extent.

Mr. *J. C. Freeman*, the Town Clerk of Maldon, said the maintainable profits put forward by the Company included £34 for rents of real estate; and it was proposed to capitalize this at 33⅓ years' purchase. He knew the value of land in Maldon very well, and held that this £34 was only worth 15 years' purchase.

This closed the case for the Corporation.

Mr. Shiress Will, in addressing the Arbitrator, said the Company could on no consideration be valued as a statutory concern; for according to the agreement in the Act, the purchase was to take effect as from Dec. 31, 1897, while the Act making the Company statutory was obtained in 1898. One test as to whether the Company was a first-class concern was afforded by the dividends, which for the years from 1887 onwards were 3, 5, 5, 2½, 3, 4, 4, 4½, 4, and 5 per cent. in 1896. Then came the extraordinary fact that for the account year, 1897, the Company managed to screw the dividend up to 10 per cent.—double that of the previous year, though the income was practically the same. In view of this latter fact, he discarded the 10 per cent. as unreliable, and as not showing that the Company could maintain a dividend nearly so high. Another test as to whether the Company were in the first category was given by their capacity in dry weather; and this Mr. Strachan said was only sufficient to supply 12½ gallons a head, allowing nothing for trade purposes. Was that a Company which should be valued at 33⅓ years' purchase? They had no further water on which they could rely. If they sank their well and disturbed the Thanet sand, there would be trouble. That the Company themselves realized that they could obtain no more water by deepening the Spital Road wells, was shown by the fact that when they wanted more water they purchased Wantz Mill. With regard to the complaints, the learned Counsel pointed out that when the Company had plenty of water the consumers received plenty, and that it was when water was scarce that the consumers were in want. This showed that the complaints, generally at least, were not due to deficiencies in fittings, but to deficiency in the supply. Mr. Cripps said Mr. Strachan's valuation was unique; but it was also unique to claim, as the Company were doing, £900 for every £100 of share capital. Another thing that was unique was the large proportion of debentures to share capital, which showed unsound finance. The claim for profit estimated to arise from connections with houses not at present supplied could not be permitted, as it was included in the 10 per cent. allowance. With regard to the claim in connection with the conversion of the debentures, it was idle for Mr. Bryan to say he knew of other companies paying 3 per cent. on borrowed money, because those companies had a sufficiently large capital behind the debentures to afford them security, which was not the case here. This was the reason why the Maldon Company were obliged to pay 4 per cent. Counsel admitted that Mr. Strachan's method of valuation was not general; but the circumstances of the present case were so unusual that an exceptional method had to be adopted in order that no injustice might be done. In conclusion, he asserted, with regard to the £18 5s. for Directors' fees, that it was cost of management, and ought to be charged to revenue; and he reminded the Arbitrator that the Company, in the agreement, had been very liberally dealt with, as the Corporation were to pay all the expenses of the present proceedings, obtaining the Act of Parliament, winding up the Company, &c.

Mr. Cripps, on behalf of the Company, said there were only two ways in which a valuation could be made. They were well ascertained now, and as a matter of principle, could not be departed from. There was the ordinary valuation—which was applicable here—on the basis of income, or, in certain circumstances, structural valuations. What Mr. Strachan suggested was the most haphazard thing he ever heard of. Mr. Strachan said he could not tell what the income was, but would take the share capital and multiply it by two. He might just as well have divided by two, or multiplied or divided by ten. Either would have been as sound in principle. The first thing to be ascertained was the net income; and it would have been competent for Mr. Strachan to say 1897 did not afford the best test. This had not been suggested; and apart from this suggestion, any company had a right to say they should be bought on the results of the trading of the last year before the purchase. In this case, it was either £385 7s. 5d., or this sum less £18 5s. for Directors' fees, which, Counsel admitted, there was much to be said in favour of deducting. He was uncertain whether the agreement made the Company statutory or not; but the number of years' purchase was not much different in either case. It would materially have affected the claim if it had been shown that the Company had an insufficiency of water; but he did not think this had been done. They had no test of what the actual yield of the wells was. Mr. Strachan put it at 60,000 gallons a day; but the only importance of this was in regard to the second item of the claim—the £2900 for future profits. If the Arbitrator thought the Company would be unable to supply the houses at present unsupplied, he would make a corresponding deduction; but this could not affect the present income, because the Company were actually earning it. As to whether the number of years' purchase should be 33⅓ or (say) 25, the learned Counsel was inclined to think there would have to be some concession from the former figure. He did not agree with Mr. Strachan on the question of finance. They should always get capital on the easiest terms; and if debentures afforded the best means of raising money, that was the way to do it. The question was whether they could raise debentures on easier terms in the future than the past. Possibly the rate would be between 3 and 4 per cent.; and certainly if it was less than the present rate, the Company were entitled to claim in respect of it. He felt fully satisfied that, when the Arbitrator came to look into the accounts, he would see nothing unique in the case which would disable him from ascertaining the proper figure to capitalize. The way to act was to apply right principles, and accept the results they led to—not to look at the result, and then, seeing that the figure was large, turn back and alter the principle to reduce it.

The proceedings then terminated, and the award has not so far been made public.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

In conversation this afternoon with one of the leading members of the Edinburgh and Leith Gas Commissioners, I learned that the Works Committee on Monday resolved to recommend the adoption of Mr. Herring's report (published last week) upon the new gas-works at Granton. The recommendation comes before the Commissioners at a general meeting on Monday next; and there is not the slightest doubt but that it will be adopted. The Commissioners feel that in Mr. Herring they have secured the services of the most capable of Engineers. They cannot imagine that anyone else could have led them so clearly to see the way in which they should go. It is pleasant to contemplate the fact of an officer who has not yet seen two years' service with the Commissioners obtaining their entire confidence in a matter of such magnitude. Mr. Herring is to be congratulated upon being able, in so short a time, to lift the gas supply of the capital of Scotland into a leading position; and no less are the Commissioners to be congratulated upon the fact that, when the opportunity arose, they were able to select a gentleman who was capable of accomplishing this.

This has again been a week of great darkness, not so much on account of prevailing gloom induced by a low firmament, as by the presence of fog. Thursday and Friday were more or less foggy over the greater part of the south of Scotland; but, as usual, it was in the west that it was most dense. Navigation upon the Clyde was suspended for nearly the two days. In Glasgow, the fog was so dense that the street-lamps were lit during the day; and it is reported that people had to be right under an electric arc lamp before they were aware of its presence. There was a very heavy demand upon the gas-works; but they were able, by straining their resources and lowering the pressure, to meet it. In the electricity department, the service was exceedingly weak, notwithstanding that all available plant was in operation. To-day the fog has partially lifted.

Another feature of recent weather has been excessive rainfall. Previous to the beginning of this week, there had been rain in Glasgow—some days continuous, but every day heavy—for eighty days. Almost three months of rain is a gloomy experience to pass through. The severity of the rainfall is testified to by the fact that one day, about a fortnight ago, more than 2 inches of water fell at Langholm. On the Pentland Hills, in the east of Scotland, where a meteorological station is maintained, it rained every day since this year came in until the 22nd of the month. The average depth was from one-tenth of an inch to half an inch per day. Agriculturists are feeling the moisture in their lands to be somewhat superabundant. Those who have charge of water-supply works are, on the other hand, quite pleased to see so much water. Not only are they able to start the year with reservoirs overflowing, but catchment areas have got so saturated that, come what sort of weather may during 1899, a supply of water to urban communities is practically assured.

The Larkhall Gas Company, who serve a district in Lanarkshire not very far from Carluke, where entirely new gas-works were only recently

opened, have also found it necessary to augment their plant, on account of a growing demand for gas. Confining themselves at present to the providing of additional storage, the Directors consulted Mr. A. Gillespie, of Glasgow; and on his recommendation, they resolved to construct a gasholder with a present capacity of 72,600 cubic feet, but so prepared that when necessary another lift can be added, which will double the size of it. A suitable site adjoining the works was obtained; but as only part of the underlying seams of coal have been worked out, and others may still be, it was decided to construct the tank of cast iron set on a bed of concrete. The tank measures 72 feet diameter by 20 ft. 6 in. deep; containing when full 521,660 gallons, or 2328 tons, of water. The holder is 68 feet diameter by 20 feet deep, forming what will ultimately be the upper or inner lift. It contains when full over 72,000 cubic feet; and when 20 feet is added the total capacity will be 143,800 cubic feet. The contract for the excavation and concrete foundation was let to Mr. A. H. Boyle, Contractor for the new Lanarkshire and Ayrshire Railway; and Messrs. Henry Balfour and Co., Limited, of Leven, Fife, were entrusted with the gasholder and tank. The work has been carried out to the design and specifications of Mr. Gillespie, who also supervised the construction, assisted by the Gas Manager (Mr. T. Stewart). On Tuesday, the Directors and friends interested in the undertaking met at the gas-works; and after an inspection of the holder, the gas was turned on to the street-mains by Mr. Andrew Hamilton, who has been for many years the Chairman of the Company. After the initiatory ceremony, the company adjourned to the London Hotel, where luncheon was served and presentations of a silver tea service for Mrs. Hamilton, and of a silver mounted walking stick for Mr. Hamilton, were made.

Trouble seems to dog the steps of the Cowdenbeath Gas Company in their endeavour to introduce a new gas into the burgh. It will be remembered that some time ago they began to send out oil gas, after complaints had become pressing with regard to their charging 10s. per 100 cubic feet for acetylene gas. Since then the community have been quiescent in the matter of gas supply; but now the accounts are being sent out, and the charge is found to be 7s. 6d. per 100 cubic feet. Consequently what is called the "agitation" has again broken out. It is, in one sense, no concern of mine what the Cowdenbeath Gas Company charge for their gas, or what gas they supply. Generally, however, the remark is not out of place that Cowdenbeath is scarcely the town where it might be expected that anything other than coal gas should be supplied, or could be supplied so profitably. It lies in the immediate neighbourhood of a coalfield which produces abundance of gas coal; and cannel and splint might be carted from the pit-head to the gas-works. In fact, if there is any place in Scotland outside the Hamilton district where coal gas should be supplied cheap, it is in the part of Fifeshire which finds in Cowdenbeath its railway centre.

I read of an explosion of acetylene gas in Aberdeen last night, by which a boy suffered severe injury and great damage was done to property. In the warehouse of a firm of ironmongers the boy was searching for something by means of a lighted match. He thoughtlessly threw the match into a tank which had the previous day been emptied of acetylene gas. The explosion which resulted blew out seven windows in the place; and the boy's face was so injured that it was covered with blood. This is a violence which is not, as a rule, associated with explosions of coal gas, even where the admixture which takes fire is the contents of a whole apartment, and not merely of a tank in the place. The explosive mixture seems to be more powerful by far than that which is composed of coal gas and air; and, in the light of this experience, it would seem to be the duty of everyone associated with the supply of acetylene gas to be more than usually careful how they handle it. This, it is to be observed, is not an explosion resulting from the use of inferior carbide, but from a mixture of gas and air—which certainly makes the matter all the more instructive.

A litigation in which gas managers will be interested has arisen between Mr. Thomas Barr, coalmaster, of Glasgow, and Messrs. Bowman and Co., coalmasters, of Buckhaven, Fifeshire. It is asserted by the pursuer that an agreement was entered into between him and the defenders, under which he got the defenders' Denbog cannel on to the coal list of the Glasgow Corporation Gas Committee. To do this, he says, required a good deal of time and trouble, as certain analyses and tests of the coal had to be made. Having got the coal on to the list, he says that the agreement was that the defenders were only to sell cannel to the Glasgow Corporation through him, and that he was only to tender their cannel to the Corporation. This agreement was observed from 1890 to 1898. In the latter year, however, it is said, the defenders sold their cannel to the Glasgow Corporation through another agent. The allegation is that the defenders took advantage of the fact that their coal had been got on to the list; and that their conduct amounted to a breach of contract, leading to loss on the part of the pursuer, who, having restricted himself to the defenders' coal, was unable to tender to the Glasgow Corporation. He sues for £1500 damages. The defenders say that there was no contract restraining either them or the pursuer; and that in 1898 they offered their coal to the pursuer—30,000 tons at 9s. 4d. per ton, or 10,000 tons at 9s. 5d.—but the offer was not accepted, and was after some correspondence withdrawn. After this they sold the coal, through another agent, at a higher price than they had offered it to the pursuer. They maintained that they were perfectly free to do this. Lord Stormonth-Darling on Tuesday ordered proof in the action.

On Thursday morning a fatality by gas poisoning occurred in the St. Rollox district of Glasgow, a part which is inhabited by a working-class population. A man named Mayes, a labourer, residing at 44, Bright Street, who is a night-shift worker in the Blochairn Iron-Works, on returning home shortly after 7 o'clock in the morning, could not get admittance to his house, which is on the street level. With the assistance of a police constable, the door was forced open; and it was found that Mrs. Mayes, the only occupant of the house during the night, was lying in bed dead. There was a strong smell of gas in the house. In the dwelling on the other side of the passage which leads to the stairs connecting with the flats above, a young woman was found suffering from sickness, as the result of inhaling gas; and in the rooms above that occupied by Mayes, the smell of gas had been noticed. The window and door were, however, opened, which probably prevented further fatalities. Great commotion arose on the death of Mrs. Mayes becoming known; and in the midst of the confusion, the gas became ignited, and an explosion resulted, which did considerable damage to property, but fortunately injured no one. In the course of Thursday, a Mrs. Jobson, who lived at No. 46, complained of sickness, and was found to be suffering from gas poisoning. The latest information on the subject is that all the persons affected are making satisfactory progress towards recovery, except Mrs. Jobson, who is not quite out of danger. The cause of the unfortunate occurrence was found to be a fracture in a service-pipe in the common passage.

On Thursday afternoon, damage to the amount of about £2000 was caused by an explosion and subsequent fire in the Clyde Iron-Works near Tollcross. About 2 o'clock one of the smaller tar-tanks in the ammoniacal department of the works exploded, and scattered the heated contents all round. Fortunately none of the workers were injured. The damage done by the actual explosion was not very great; but the flame reached a series of tar-pits in the vicinity, with the result that they were immediately in a blaze. The Glasgow Fire Brigade were summoned; but the firemen were greatly hampered by the lack of ready access to water. The water had to be pumped from the Clyde, so that some little time elapsed ere the flames could be seriously attacked. Efforts were mainly directed towards saving the ammonia-house and the engine house, which the firemen were ultimately able to preserve almost intact. Taking advantage of several lines of rails in the works, the employees ran waggons of sand up to the seat of the fire—this material being much more effective as an extinguisher than water in a case of this kind. After three hours' hard work, the brigade were able to return to Glasgow, having succeeded in confining the fire to the department where it originated. Three pits of tar and a large bing of pitch stored in blocks, together with a building used as a cooper's shop, were destroyed. Regarding this incident, I cannot help thinking how slowly knowledge filters down. It ought to have been known to the workers in the place, and to the Fire Brigade particularly, that water has a very poor effect in extinguishing burning tar, and that the most effective substance for the purpose is ammoniacal liquor. There must have been abundance of this material at hand. Had it been applied, instead of three hours being required, the fire would have been out in a few minutes.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 28.

Sulphate of Ammonia.—The activity of the past few weeks has given place to a very quiet market and easier prices; the closing quotations being £10 7s. 6d. per ton f.o.b. Hull, £10 8s. 9d. Leith, and £10 10s. Liverpool. Having "covered" sales for January delivery, speculators retired from the field; and the market has been mainly in the hands of consumers, who all along have resisted the advance. The large makers, having fully sold for the month, and fairly well some way ahead, have been practically off the market; but the smaller makers have offered their output as ready, and have submitted to the decline. There has been very little done in the forward position, buyers not being interested at makers' quotations, which are £10 10s. per ton, ordinary terms, f.o.b. Leith, February-June delivery, and London delivery over same period, Beckton terms, £10 5s. per ton.

Nitrate of Soda is quiet on spot at 7s. 6d. per cwt. for ordinary, up to 7s. 7½d. per cwt. for fine, quality.

LONDON, *Jan.* 28.

Tar Products.—This market presents no interesting feature at the moment. The consumption of creosote oil continues good; and this product is said to be scarce in most quarters. A better demand for creosote has reflected itself on the position of napthalene, the lower grades of which are in better demand at advanced prices. A moderately steady market for carbolic acid is absorbing production. A feature of the demand is that lower qualities are being bought; and the price for them attracts a slightly better value than the richer qualities. Anthracene continues sick; and the little inquiry which somewhat excited the market a few weeks ago has apparently died off. There is no change for the better in benzol. On the contrary, buyers are offering less money; and business is reported at a fall on previous quotations. An indifferent market for solvent and naphthas has eased market quotations for them.

Business during the week has been marked as follows: Tar, 14s. to 19s. Pitch, east coast, 24s. 6d.; west coast, 21s. 6d. Benzols, 90's and 50's, 7½d. Toluol, 1s. Solvent naphtha, 1s. 2d. Heavy naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 3½d. Creosote, 3d. Heavy oils, 52s. 6d. Carbolic acid, 60's, 2s. Creosote salts, 40s. Anthracene, nominal, "A," 4d.; "B," 2¾d.

Sulphate of Ammonia.—A determined effort on the part of dealers to depress this article has been partially successful. This is all the more remarkable since few makers have any stock, and really nothing to sell, most producers being fully contracted. Higher prices are quoted for north country ports than for west and south-east ports; there being a difference of something like 5s.—the values ranging from £10 2s. 6d. to £10 7s. 6d., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—With the spell of cold weather during the past week, the better qualities of round coal have been moving away more freely; and collieries have been filling up to some extent out of stocks to meet requirements. Some of the local pits, however, have still fairly large quantities of best coal on the ground; and a continuance of the cold weather will be necessary to enable them to clear all these away before the summer opens. Medium and lower qualities of round coal are in brisk demand, with no difficulty experienced in moving away all the pits can produce, and also a good deal going out of stock. The same applies to common round coals, which are in active demand both for inland requirements and for shipment, with rather better prices, if anything, being obtained on shipping orders. At the pit, quotations for inland sales remain firm at 12s. to 12s. 6d. per ton for best Wigan Arley, 10s. 6d. to 11s. for Pemberton four-feet and seconds Arley, 9s. 6d. to 10s. for common house coal, and 8s. 6d. to 9s. for steam and forge qualities. For delivery at the Garston Docks or the High Level, Liverpool, ordinary

qualities of steam coal are fetching 9s. 6d. to 10s. per ton. Engine classes of fuel have been more plentiful; supplies coming forward from outside districts at rather under the prices quoted by Lancashire collieries, whose customers have in many cases been enabled to place their orders elsewhere at more favourable rates. The demand, however, is generally still more than sufficient to take away the output of the pits; and prices at the Lancashire collieries are very firmly maintained at the full rates that have been ruling of late. Common slack averages 4s. 6d. to 4s. 9d. per ton at the pit, medium 5s. 3d. to 5s. 6d., and best qualities 6s. 3d. to 6s. 9d.

North-Eastern Coal Trade.—With the colder weather, there is a stronger demand for coals; and the pits are kept fully at work. Best Northumbrian steam coals are about 10s. 6d. per ton f.o.b., second qualities about 9s. 9d., and steam smalls 4s. 3d. There is no alteration in the manufacturing coal trade; but the demand is steady. Gas coals are firm, and in larger consumption. The medium price for best Durham gas coals is now about 8s. 9d. per ton f.o.b. The large contract for the coals for the supply of Copenhagen has been allotted again to the three Durham collieries which usually take up this contract; and the price shows an advance of about 9d. per ton on last year's quotations. Gas coke is steady in demand; and the large production seems to be taken up without much addition to stocks. Prices are unchanged.

Scotch Coal Trade.—The coal trade continues exceedingly active. The demand is great; and contracts for two or three months ahead, at present prices, are quite common. Even in the chief quarter where an outcry is frequently raised that the railway companies supply an insufficiency of waggons, it is admitted that the service is up to requirement. The complaint is altogether a hollow one, as it is not the railway companies who will not supply the waggons, but the coalowners who keep them standing loaded in the expectation of better prices. Of course, it is only their own waggons they can thus deal with; and the railway companies, who are accustomed to rely upon traders' waggons being available, are sometimes taken aback when the traders hold up their own waggons and insist upon the companies providing carriage, when it suits them. The fact that traders are running their waggons, instead of keeping them standing full, is an indication of the healthiness of trade. The prices quoted are: Main, 9s. 3d. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s., and splint 10s. 3d. The shipments for the week amounted to 161,982 tons—an increase of 43,545 tons upon the previous week, and of 15,542 tons upon the corresponding week of last year. For the year to date, the total shipments have amounted to 342,823 tons—a decrease of 41,817 tons upon the same period of last year.

Hastings Water Supply.—Col. A. G. Durnford held a Local Government Board inquiry at Hastings last Tuesday respecting the Town Council's application for sanction to borrow £2265 for water-works purposes.

A Wooden Water-Pipe.—At a meeting of the Newcastle Society of Antiquaries last Wednesday, Mr. L. W. Adamson stated that recently an old wooden water-pipe was discovered in an excellent state of preservation, near St. Andrew's Church. It was an elm tree, hollowed out, about 3½ inches thick, with a bore of 4 inch.

The Poll on the Ossett Gas-Works Purchase Question.—Last Saturday, a poll was taken on the question of the purchase of the Ossett Gas Company's undertaking by the Corporation, with the following result: For the purchase, 833; against it, 172—majority, 661. Only half the electorate voted; but it had been generally expected that there would be a majority in favour of purchase.

Crawley and District Water Company.—The first ordinary general meeting of this Company, which was incorporated last year, was held on Wednesday, under the presidency of Mr. J. Longley. The Chairman stated that the Directors had endeavoured to push forward the necessary work as quickly and economically as possible. The land for the well and reservoir had been purchased, and the contract for the shaft and boring had been let.

Bude and Stratton Water Supply.—The discussion which has gone on for several years respecting the provision of a water supply for Bude and the neighbouring village of Stratton seems likely to lead at last to a definite result. A meeting has recently taken place between a Committee of the Stratton Rural District Council and a representative of the shareholders of the Bude Canal, at which it was agreed that the canal and reservoir should be transferred to the Council at a price which will give the shareholders something less than £4 10s. per share. If this arrangement is confirmed by the Council and the shareholders, it will put an end to the difficulty. The canal scheme is one of several considered by the Council, though previous efforts to give effect to it have been unsuccessful.

Madeley Water Supply.—Alderman A. B. Dyas last Wednesday presided over a meeting of the Madeley District Council, when the report of the Engineer, Mr. Stooke, as to the cost of the Harrington water supply was read. He said he based his calculations on the provision of plant capable of delivering 250,000 gallons of water in twelve hours with the service reservoir at the Meadow Pit mound. The capital charge he reckoned at £13,260; and he put the cost of the reservoir, capable of containing 360,000 gallons, at £1966, and for mains, &c., at £2850. He estimated the cost to the Broseley authority at £3532, and to the Wenlock authority at £2500. The scheme was recommended by the Sub-Water Committee, and adopted with one dissentient. It was remarked that the Council would have to apply to the Local Government Board for permission to borrow £15,000 or £16,000.

Leigh Gas-Works Extensions.—At a meeting of the Gas, Water, and Electricity Committee of the Leigh District Council yesterday week, it was reported that the Local Government Board had forwarded their formal sanction to the borrowing of £6140 for the provision of working capital for the gas-works, the sum to be repaid in ten years. The Clerk reported that he had written to the firms who had previously tendered for the extension of the works, requesting them to submit amended tenders for the coke plant. The tenders so received were opened; and it was resolved to accept that of Messrs. Graham, Morton, and Co., Limited, to execute the works required in connection with the erection of the new carbonizing plant on the inclined system in accordance with the general conditions, amended specification, and form of tender, dated Jan. 21, 1899, for the sum of £14,110, and to allow £2 per ton for old cast iron, wrought iron, and steel.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 236.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	22—23	..	4 11 4
100,000	10	,,	7½	Do. 7 p. c.	16—17	..	4 8 3
300,000	100	Jan. 3	5	Australian 5 p. c. Deb. .	104—106	..	4 14 4
200,000	5	Nov. 11	6	Bombay, Ltd.	6¾—6¾	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid .	4¾—5	..	4 16 0
380,000	Stk.	Aug. 12	12	Brentford Consolidated	277—282	..	4 5 1
240,000	,,	,,	9	Do. New	210—215	..	4 3 9
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	Dec. 15	4	Do. 4 p. c. Deb.. .	128—133	..	3 0 2
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig..	263—268	..	4 5 10
226,320	,,	,,	8½	Do. A. Ord. Stk. .	193—196	..	4 6 9
933,500	Stk.	Aug. 31	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	47—49	..	4 1 8
50,000	10	Aug. 12	11½	Bromley, Ord. 10 p. c. .	26—28	..	4 2 2
75,000	10	,,	8½	Do. 7 p. c. . . .	20—22	..	3 17 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¼—10	..	6 0 0
220,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0
150,000	20	July 14	8½	Cagliari, Ltd. . . .	29—30	..	5 10 0
100,000	10	Sept. 23	7	Cape Town & Dis., Ltd.	14—15	..	4 13 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	57—59	..	5 1 8
550,000	Stk.	Oct 13	13½	Commercial Old Stock .	310—315	..	4 5 9
200,750	,,	,,	10½	Do. New do. .	240—245	..	4 5 9
200,750	,,	Dec. 15	4½	Do. 4½ p. c. Deb. .	145—150	..	3 0 0
800,000	Stk.	Dec. 15	10	Continental Union, Ltd.	300—305	..	4 17 7
200,000	,,	,,	7	Do. 7 p. c. Pref. .	187—192	..	3 12 11
51,600	Stk	Aug. 31	14	Croydon A 10 p. c. . .	305—310	..	4 10 4
168,400	,,	,,	11	Do. B 7 p. c. . .	255—265	..	4 3 0
555,000	Stk.	Aug. 12	5½	Crystal Palace Ord. 5 p. c.	127—132	+2	3 19 7
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	22—23*	..	4 15 8
354,060	10	,,	11	Do. £7 10s. paid .	17—18*	+½	4 11 9
14,993,075	Stk.	—	—	Gas- 4 p. c. Ord. . .	119—121	−1	—
2,500,000	,,	—	—	light 3½ p. c. max. .	101—103	+1	—
3,799,735	,,	—	—	and 4 p. c. Con. Pref.	126—128	+1	—
3,843,975	,,	—	—	Coke 3 p. c. Con. Deb.	100—102	..	—
70,000	10	Nov. 11	8	Hongkong & China, Ltd.	14—15	+½	5 6 8
3,800,000	Stk.	,,	10	Imperial Continental .	230—235	+2	4 5 1
376,400	100	Aug. 2	4	Do. 4 p. c. Deb. Red.	98—101	..	3 19 8
478,600	Stk.	Aug. 12	5½	Do. 3½ p. c. Deb. ,,	102—105	..	3 6 8
75,000	5	Nov. 30	6	Malta & Medn., Ltd. .	5—5½	..	5 9 1
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	112—114	..	4 7 9
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	107—109	..	4 2 7
541,920	20	Nov. 11	5	Monte Video, Ltd. . .	14—15	+½	6 13 4
617,946	Stk.	Aug. 31	9½	Newc'tle & Gatesh'd Con.	232—236	..	4 2 8
252,355	Stk.	Dec. 30	3½	Do. 3½ p. c. Deb. .	107—110	−5	3 3 8
150,000	5	Nov. 30	8	Oriental, Ltd. . . .	7⅞—7¾	..	5 3 3
135,000	5	,,	8	Do. New, £4 10s. pd.	6¼—6⅜	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5
60,000	5	Sept. 29	7	Ottoman, Ltd.	5—5½	..	6 6 2
500,000	100	Dec. 1	6	People's Gas 2nd Mtg. of Chicago Bond's .	102—106	..	5 13 2
848,070	10	Oct. 13	6	River Plate Ord.. . .	9⅜—10¼	+⅛	5 17 1
250,000	Stk.	Dec. 30	4	Do. 4 p. c. Deb. .	100—102	+1	3 18 5
250,000	10	Sept. 29	10	San Paulo, Ltd. . . .	16—17	..	5 17 8
135,000	Stk.	Sept. 15	10	Sheffield A.	242—245	..	4 1 8
209,053	,,	,,	10	Do. B.	242—245	..	4 1 8
447,427	,,	,,	10	Do. C.	242—245	..	4 1 8
5,600,000	Stk.	Aug. 12	5⅛	South Metrop., 4 p.c Ord.	143—146	+2	3 13 0
1,460,000	,,	Jan. 13	3	Do. 3 p. c. Deb. . .	100—102	..	2 18 10
60,000	Stk.	Aug. 31	12	Tottenham and A. .	280—290	..	4 2 9
60,000	,,	,,	9	Edmonton B. .	200—210	..	4 5 9
182,380	10	Dec. 30	5	Tuscan, Ltd.	9¼—10½	..	4 15 3
149,900	10	Jan. 3	5	Do. 5 p. c. Deb. Red.	99—101	..	4 19 0
				WATER COMPANIES.			
746,184	Stk.	Dec. 30	11	Chelsea, Ord.	310—315	..	3 9 10
150,000	,,	,,	5	Do. 5 p. c. Pref. .	168—173	..	2 17 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	147—150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb. .	157—162	..	2 15 7
1,720,560	Stk.	Oct. 13	7	East London, Ord. . .	215—220	+1	3 3 8
654,740	,,	Dec. 30	4½	Do. 4½ p. c. Deb. .	157—160	..	2 16 3
390,000	,,	,,	3	Do. 3 p. c. Deb. .	101—103	..	2 18 3
700,000	50	Dec. 15	7½	Grand 10 p. c. max. .	170—115	+2	3 5 3
310,000	Stk.	Sept. 29	4	Junction 4 p. c. Deb. .	138—143	..	2 15 11
708,000	Stk.	Aug. 12	14	Kent	365—370	..	3 15 8
160,000	,,	,,	7	Do. New, 7 p. c. max. .	212—217	..	3 4 6
1,043,800	100	Dec. 30	10½	Lambeth, 10 p. c. max. .	295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p. c. max. .	225—230	..	3 9 7
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb. .	138—143	..	2 15 11
500,000	100	Aug. 12	13½	New River, New Shares	432—437	..	3 0 8
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb. .	137—142*	+1	2 16 8
902,300	Stk.	June 29	7½	South- Ord. . . .	197—202	+7	3 14 3
126,500	100	,,	7½	wark 7½ p. c. max..	183—188	+3	3 19 9
489,200	Stk.	,,	5	and 5 p. c. Pref.	168—171	..	2 18 6
1,019,585	,,	Oct. 13	4	Vauxhall 4 p. c. A Deb.	138—143	..	2 15 11
1,155,066	Stk.	Dec. 15	10	West Middlesex . . .	297—302	+2	3 6 3
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	160—163	..	2 15 3
200,000	,,	Sept. 15	3	Do. 3 p.c. Deb. .	102—105	..	2 17 2

* Ex div.

Sales of Shares.—At a sale of miscellaneous stock at Leeds last Tuesday, a £200 Leeds Corporation 4 per cent. funded water-works irredeemable bond realized £140 per cent. On the following day, 45 shares (£5) in the Coupar Angus Gas Company were sold by auction and realized £6 6s. per share.

New Joint-Stock Company.—The Lecomte Intensified Gas-Light Corporation, Limited, has been registered with a capital of £25,000, in £1 shares, to enter into an agreement with I. Loeser and A. Lecomte, and to manufacture, sell, and deal in incandescent lights and all kinds of apparatus and materials for economizing the consumption of gas.

Darlington Gas Workers and their Wages.—A special meeting of the Gas Committee of the Darlington Corporation was held last Tuesday, for the purpose of considering the report of the Sub-Committee who had been investigating the question of the men's wages at the gas-works, and the suggested amendments to the Committee's proposals made by the men's deputation. The report, which, it is understood, did not go far beyond that published last week (p. 195), was adopted. One of the re-arrangements refers to the lamplighters, who are to be excused certain work that they at present object to. The Committee decided not to give any information to the Press.

Rainfall in the Cardiff Watershed.—The New Year's rainfall, up to the morning of the 20th inst., as registered at Nantpenig, the highest station maintained for gauging purposes in the Taff Fawr section of the Cardiff Corporation watershed, was 10·72 inches. This is an unprecedented fall for January; previous records offering no parallel to this high total. During the 24 hours ending at 9 a.m. on Saturday, the 21st inst., the fall was not far short of 3 inches; thus bringing the total for January to that date to above 13 inches. For the whole of January of last year, the fall, as recorded at the Beacons reservoir, was no more than 6·80 inches. For the last month of the old year, the fall, as registered at the Beacons reservoir, was no less than 14·39 inches; and it will thus be seen that during seven weeks, a fall of close upon 30 inches has been recorded in the Taff Fawr section of the works.

Rating of the Weymouth Gas Company.—Some time ago the county authorities instructed Messrs. Castle and Castle to re-value the Weymouth Gas Company's works; the result being that the net rateable value was increased from £1591 to £2499, with a gross rateable value of £2999. These figures were adopted by the Assessment Committee, but were considered by the Company to be excessive. They therefore sought the assistance of Mr. W. A. Valon, who, after considerable correspondence, appeared before the Committee last Friday, with the result that the net rateable value was reduced from £2499 to £2030, being an increase on the old assessment of £439, of which £30 is due to a new assessment. In agreeing to this figure, Mr. Valon stipulated, on behalf of the Company, that the Committee should consider this addition as sufficient to cover any increased rateable value that might be attached to the extension of the works which the Company are at present making, and which will enable them, when completed, to add considerably to their present output. This arrangement having been come to, the Company are very well satisfied at the result of the appeal.

Barry Water Supply.—The water supply of Barry is to be augmented at a cost of £13,000. It is proposed to sink a new well and carry out other improvements.

South Staffordshire Water-Works Company.—The Directors of this Company have resolved to transfer £2000 to the credit of depreciation fund, and to recommend to the proprietors the declaration of a dividend for the half year ended Dec. 31 on the ordinary stock at the rate of 6 per cent. per annum, free of income-tax; leaving a balance of £6243 to the credit of profit and loss account.

Connection Between London Water Companies' Mains.—With the view of safeguarding the supply of water to the eastern districts of the Metropolis, should a similar drought occur in the present year to that which was experienced in 1898, the Grand Junction Water Company have arranged, at the request of the President of the Local Government Board, to lay a 30-inch main from their Campden Hill works to Poland Street, so as to form a direct communication with the reservoir of the New River Company at Clerkenwell, whence the Company will be able to transmit to the East London Company any water which can be spared. In order to expedite the completion of the work, it is proposed to lay the main through Kensington Gardens and Hyde Park, thus avoiding the delay and expense of opening roads.

Gas Explosion at Horncastle.—An alarming explosion of gas occurred at the Technical School, Horncastle, on Saturday, the 21st inst. The school cleaner, a Mrs. Carter, was attending to her ordinary duties, and, to obtain hot water, had lighted the gas-jet under a small boiler used for the purpose, by the side of a large iron cooking-stove. There were a number of gas-taps about the boiler, and it is thought the woman must have inadvertently turned the large tap of the jets which heat the stove used for giving demonstrations in the cookery classes. At all events, this tap was turned, and the interior of the oven was speedily filled with gas, which, in escaping, came into contact with the lighted burner under the boiler. Mrs. Carter heard a cracking noise, which was followed by a loud report; the iron oven and all about it being blown to pieces. Mrs. Carter was scalded by the hot water in the boiler; but fortunately she escaped more serious injury.

The New Water-Works for Bacup.—The preparations for the construction of the new water-works at Cowpe for the Bacup Corporation are proceeding apace. The Engineer has instructions to get the work in hand as quickly as possible; and it is probable that tenders will be advertised for shortly, and that the actual work will be commenced early next summer. In this connection it may be stated that the Water Sub-Committee of the Bacup Corporation have received a communication from the Haslingden Town Council with a view to that body becoming participators in the Cowpe scheme. It is generally considered that the Cowpe supply will be ample for any two of the Rossendale boroughs; and it would be a very great advantage (says a local paper) not only to Bacup, but to either Rawtenstall or Haslingden, if they could secure release from Bury and unite with Bacup in the scheme. Whether they can get this release, however, is very doubtful, especially as Bury are proposing to make special provision for Haslingden.

Reductions in Price.—The Newquay Gas Company have made a further reduction of 3d. per 1000 cubic feet in the price of gas for both lighting and cooking purposes. The price of gas in Sydney has been reduced by the Australian Gas Company, as from the 1st inst., by 3d. per 1000 cubic feet; bringing it down to 4s.

Incandescent Gas Lighting at Toulouse. — The Municipality of Toulouse have lately substituted Welsbach burners for the incandescent electric lamps in the Allée St. Michel, as well as in the offices of the Capitol. Economy combined with superior light, as shown by prolonged experiment, is said to be the cause of the change of system.

Bordeaux Gas Company.—The quantity of gas sold by this Company in the past financial year was about 909½ million cubic feet, which brought in a sum of £153,086; being less by £367 than in the preceding twelve months, owing to a falling off in the consumption. The net amount available for distribution allowed of the payment of a dividend of £3 12s. per £20 share, with a balance of £1494 to the good. The reserve fund stands at £34,685; exceeding by £22,685 the usual proportion of one-tenth of the share capital.

New Gas-Works for Mulhouse.—The gas-works at Mulhouse having been found inadequate to meet the increased demand for gas which has resulted from a reduction in price, it has been decided to erect new ones, plans for which have been prepared by the Manager (M. Kellner). We learn from the "Journal de l'Eclairage au Gaz" that most of the plant will be supplied by local firms. The retorts will be set on the Coze system; the holder will have the united capacity of those now in use; and the mains running to the centre of the town will be of increased diameter. The works, which will cost about £75,000, are to be commenced in the spring, and finished by next winter. The Municipality receive 1 pf. per cubic metre on all gas supplied.

Essex and the London Water Question.—The Essex County Council have resolved to oppose the London County Council's Water Bills. At a meeting of the Water Committee of the Council, under the presidency of Mr. W. B. Whittingham—representatives of the District Councils in the Metropolitan (Essex) area being present—strenuous opposition to all three Bills was unanimously agreed upon, mainly on the ground that the London Council have, on the recommendation of their own Water Committee, abandoned the principle "to accord to the Outside Authorities the same freedom of administering their own supply as the London County Council claims for itself." It was set forth that, after agreeing to terms with the Essex authorities on this reasonable basis, they now signified their intention to leave Outside Authorities to fight their own battles. The London Council proposed to acquire the whole, and possibly transfer back the works and powers of distribution, not the sources of supply. As the East London Company's sources in Essex would be ample for Essex if not used for the London area west of the River Lea, a very natural and even heated opposition would be raised, and resolve itself into a cry of "The Sources of Supply in Essex for Essex." The development of the principal districts affected—West Ham, East Ham, Leyton, Walthamstow, Woodford, Wanstead, and Barking—made the retention of the Essex water wells for the Essex area a matter of the very highest importance.

The Corporation of London and The Gaslight and Coke Company.—At the instance of the Streets Committee, the Corporation of London have decided to oppose the Bill of The Gaslight and Coke Company.

The Price of Water to the Large Consumers of Stockton and Middlesbrough.—A special meeting of the Stockton and Middlesbrough Water Board was held last Friday to consider clause 26 of their new Bill, relating to the charge for water to large consumers. The Board sought to increase the charge from 3d. to 6d. as a maximum price per 1000 gallons; and the ironmasters threatened to oppose the Bill. It was reported that a Committee had had an interview with them, and an arrangement had been come to by which they would pay 3½d. per 1000 gallons.

Gas Shareholders as Parish Councillors.—A singular complication is reported to have arisen at Colwall. It appears that a number of the members of the Parish Council are connected with the Gas Company; and, as a consequence, when matters affecting the Council and the Company have come to be dealt with, there has not been a quorum to vote. Application has therefore been made to the Herefordshire County Council on the subject; and the Parliamentary Committee have discussed the position. They reported at the last meeting of the County Council that they did not think it desirable that Colwall should be ruled by the Gas Company; but at the same time it was not reasonable that the parish business should at certain junctures come to a deadlock. They therefore recommended that the voting disqualification should be dispensed with in the case of the two shareholders who, not being Directors, had the smallest interest in the Gas Company. The recommendation has been adopted; and so the deadlock has ended.

York Water-Works Company.—The report of the Directors of this Company, to be submitted at the half-yearly ordinary meeting of shareholders, states that they received from Mr. Oliver Taylor, the Accountant, a full report on the accounts, and they disclosed a serious deficiency, which the late Secretary (Mr. J. W. Watson) could not account for; but as the Guarantee Society paid the amount of their guarantee without calling upon the Directors to prosecute him, and Mr. Watson's unsecured creditors voluntarily surrendered to the Directors the whole of his assets which were available for distribution among his creditors, they felt justified in simply dismissing him from the service of the Company. The Directors provided, out of their own pockets, a special guarantee fund to meet any deficiency which might arise through the late Secretary's defalcations necessitating a reduction in the dividends for the past half year; but happily the prosperity of the Company has been so remarkable that the Directors are able, out of the revenue, not only to meet the deficiency, but to recommend the payment of the maximum dividends, and to carry forward a balance of upwards of £500. They contemplate the early provision of a new subsiding-tank, and two additional filter-beds, to meet the growing requirements of the city and neighbourhood. They recommend that dividends for the past half year be declared, without deduction for income-tax, at the following rates per annum: On the preference shares, 1876, 5 per cent.; on the preference shares, 1896, 3½ per cent.; on the ordinary shares, 10 per cent.; and on the ordinary shares, 1878 and 1879, 7 per cent.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, M.E., Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
American Offices: TORONTO. TELEGRAPHIC ADDRESS: "CARBURETED, LONDON."

CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cubic Feet Daily.		Cubic Feet Daily.
BLACKBURN	1,250,000	TORONTO (Second Contract; Remodelled)	2,000,000
WINDSOR STREET WORKS, BIRMINGHAM	2,000,000	BELLEVILLE	250,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	OTTAWA (Second Contract)	250,000
COLCHESTER	300,000	BRANTFORD (Remodelled)	200,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Remodelled)	250,000
SWINDON (New Swindon Gas Co.)	120,000	KINGSTON, PA.	125,000
SALTLEY WORKS, BIRMINGHAM (Second Contract)	2,000,000	PETERBOROUGH, ONT.	250,000
WINDSOR STREET WORKS, BIRMINGHAM (Second Contract)	2,000,000	WILKESBARRE, PA.	750,000
HALIFAX	1,000,000	ST. CATHERINES (Second Contract)	250,000
TORONTO	250,000	BUFFALO, N.Y.	2,000,000
OTTAWA	250,000	WINNIPEG, MAN.	500,000
LINDSAY (Remodelled)	125,000	COLCHESTER (Second Contract)	300,000
MONTREAL	500,000	YORK	750,000
		ROCHESTER	500,000
		KINGSTON, ONT.,	300,000

CRYSTAL PALACE DISTRICT . . . . 2,000,000 Cubic Feet.

Free Gas-Fittings at Crowborough.—The Crowborough District Gas Company have announced their intention of laying on gas, on the prepayment system, to 50 cottages in their district, and to supply and fix one pendant in the kitchen, one wall bracket, and a kettle-boiler in the scullery, free of cost to the householder.

The Repair of Roadways after Main and Service Laying.—The Budleigh Salterton District Council had under consideration last Tuesday the question of the repair of the roads and footpaths which have recently been disturbed by the relaying of the gas-mains. Mr. H. C. Perriam, the Chairman of the Gas Company, wrote suggesting, in a non-official way, that the Council should undertake the work of repair, and name a sum for the Company to pay for it. Considerable discussion took place upon this suggestion, with the result that it was decided to fix the amount to be paid by the Company for the repair of the roads and footpaths in the ensuing twelve months at the sum of £200—one half payable at once, and the balance at the end of six months. This offer is to be regarded as final; and in the event of its non-acceptance, the Company are to be required to put the roads in the same state of repair as before their disturbance.

Gas Affairs at Leeds.—The Gas Committee of the Leeds Corporation have considered the question of enlarging the trunk mains, and also the extension of mains wherever they are required. Some of the trunk mains still in use are those which were taken over by the Corporation in 1870, when they acquired the undertaking of the Gas Company; and the great and increasing demand year by year on these mains renders it necessary that steps should be taken without delay to make increased provision. A report was presented to the Audit, Meters, and Mains Sub-Committee last Wednesday, dealing with the question, and proposing that the works should be carried out during the next five years. The report is to be printed, and a special meeting held to consider it. The Gas Committee are also proposing to ask the City Council to authorize them to charge a rental for meters in cases where they are retained on premises of consumers whose consumption of gas is considerably smaller than the capacity of the meter.

Carburetted Water Gas for Hamburg.—The use of carburetted water gas for increasing the illuminating power of ordinary coal gas is comparatively little known in Germany. Bremen, however, has recently set the example to the other towns of the northern part of the Empire; and we learn that Hamburg will shortly follow. Extensively used as electricity is both for lighting and power purposes in Germany's great business mart, so far is it from superseding gas as an illuminant, that the consumption of the latter has suddenly gone up to a level never before reached. To meet this largely increased demand, the Municipality, to whom the gas-works belong, purpose erecting works for making carburetted water gas. The Chemist (Dr. Leybold) states that the economy to be effected by adopting this system, instead of extending the existing works, will be that the additional facilities required for a daily production of 50,000 cubic metres will cost only 600,000 marks instead of 3,000,000 marks; will take only eight months to erect instead of from two to three years; and will afterwards only necessitate the employment of fourteen hands instead of five times the number.

The First Acetylene Works in France.—According to a recently published pamphlet by M. Emile Gautier, the Editor of "La Science Française," the acetylene works of Alzonne, in Aude, are the first which have commenced regular work in France; having been inaugurated on Nov. 7, 1898. They were built and are now conducted by the French Acetylene Gas Lighting Company, who supply 250 lamps, 30 of which are for public illumination. The pipes extend over a length of about a mile and three quarters. The pressure in the town is about 4 inches during the day, and nearly double at lighting time.

York United Gas Company.—The half-yearly report of this Company states that the balance of revenue account amounts to £4915, and the interest from the reserve investment fund to £243; making a total profit of £5158. Of this sum, £293 has been paid for the half-year's interest upon money borrowed on mortgage; leaving £4865 available for dividend—an amount short of the sum required (£7000) by £2135. This deficiency was fully anticipated by the Directors in their previous report. The general business of the Company shows satisfactory progress; the increase in gas consumption being 4 per cent. Regardless of the Company's approaching competitor in the electric light, the Directors have ample reason to look forward to the future of the undertaking with unimpaired confidence—a feeling fully endorsed by the over-subscription of the Company's recent issue of new shares.

The Castleford and Whitwood Gas Company have placed an order with Messrs. R. Dempster and Sons, Limited, of Elland, for new condensers and a Livesey washer.

The gold medal at the recent exhibition of gas appliances at the International Industrial Exhibition at Reading was awarded to Messrs. Fletcher, Russell, and Co., Limited, for the general excellence of design and the economy of their gas cooking and heating appliances.

Messrs. Simpson and Co. have secured the contract for supplying, erecting, and setting to work two new Worthington pumping engines, Galloway boiler, and overhead travelling crane at the Knighton pumping-station of the Ryde Corporation. The amount of the tender was £4542.

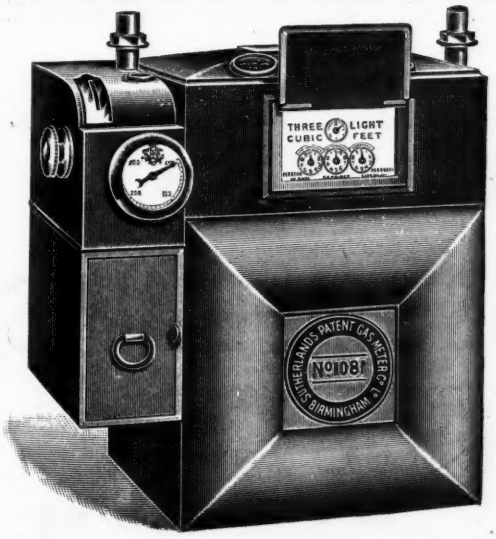
The Special Commissioner of the "Ironmonger" who has lately visited Canada records that in the window of an Ottawa gas-fitting firm he saw a clever trade sign and advertising device consisting of the words "Gas-Stoves" made of gas-tubing and plentifully supplied with small jets. He says he had not previously noticed an inside sign of this sort. He thinks the idea is capable of extension, although no more fitting article than a gas-stove could be advertised by this means.

The Morecambe Gas Company, having found it necessary to erect new purifying plant to entirely displace the existing apparatus, which has become too small to cope with the greatly increased output, have decided to erect four new purifiers, 20 feet by 27 feet; and the contract for them, together with the superstructure and roof, as well as the oxide and lime elevators, has been let to Messrs. R. Dempster and Sons, Limited, of Elland. The whole will be carried out under the supervision of Mr. W. Duff, the Gas Company's Engineer and Secretary.

SUTHERLAND'S

PATENT

PREPAYMENT GAS-METERS



SPECIAL FEATURES.

Accuracy of Measurement.

Simplicity of Construction.

Excellency of Workmanship and Material.

Every Meter Guaranteed.

THE SUTHERLAND GAS-METER COMPANY,

ESSEX WORKS, BIRMINGHAM.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S "VOLCANIC" and "VOLCUM" CEMENT. Fire Resistance up to 4500° Fahr. In use in Gas-Works all over the World.

ANDREW STEPHENSON,
182, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

Telegrams: "*Volcanism, London.*"

BROTHERTON & CO.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER LINCOLN."
[For Illustrated Advertisement, see Jan. 3, p. 10.]

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID for Sale.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SPECIAL PAINT FOR GAS-WORKS.
JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1769.

GAS TAR wanted.
BROTHERTON AND CO., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

IMPORTANT.
REPAIR your old Retorts with Patent STICKFAST FIRE CEMENT. Unequalled for Repairing Inclines. Estimates for all kinds of Retort-Settings.
Write CROWTHER, Retort Setter, and Sole Maker of Stickfast Fire Cement, Manor Street, HUDDERSFIELD.

AMMONIACAL LIQUOR wanted.
BROTHERTON AND CO., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

SULPHURIC ACID.
JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

SADLER & CO., Ld., Middlesbrough; ULVERSTON (BARROW); PORTSMOUTH; CARLTON (N.E.R.); and STOCKTON. Tar and Petroleum Distillers. Benzol and Petroleum Spirit, 700 and other Gravities specially prepared for Carburetting. SOLAR OIL for Gas Making, Kerosene, &c.
Correspondence invited.
Telegraphic Address: "SADLER, MIDDLESBROUGH."

GAS CARBON Wanted, not less than 4-Ton Loads.
Apply to the BRIMINGTON CARBON COMPANY, Sowerby Bridge, YORKS.

CANNEL, COAL, ETC.
JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, / NEWTON GRANGE, NEWBATTLE, DALKEITH, } SCOTLAND.

PATENTS FOR INVENTIONS.
J. C. CHAPMAN, M.I.M.E., and Fel. Chartered Inst. Patent Agents. ADVICE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application.
70, CHANCERY LANE, LONDON, W.C.

HYDRATED OXIDE OF IRON.
PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

WANTED, by a young Man, a position as SECRETARY to a Gas and Water Company or as ASSISTANT to a large Company. Fourteen Years' Experience; the last Nine Years as Assistant. Excellent Testimonials from present Employers.
Apply A. H. ALLWOOD, 9, High Street, Dunstable, BEDS.

WANTED, a permanent Situation as WORKING MANAGER or FITTER in a Gas-Works. Twenty Years' practical Experience in the Manufacture and Distribution of Coal Gas. Mains, Services, Meters, Iron and Compo. Pipe, including Mechanical Repairs on Works. Good References.
Address No. 3201, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-WORKS Stoker wanted for small Country Works, where Exhauster and Engine are used. Wages 22s. and 25s. respectively.
Apply MANAGER, Gas-Works, Solihull, WARWICKSHIRE.

GAS STOKERS.
WANTED, one or two steady Men, used to Shovel and Scoop.
For Particulars, apply to the MANAGER, Gas-Works, CHELMSFORD.

GAS PURIFICATION.
OXIDE OF IRON BOG ORE.
BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
Telegrams: "BOGORE, LONDON."

SPENT OXIDE wanted.
BROTHERTON AND CO., Chemical Manufacturers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

"GAS, AND HOW TO USE IT."
MR. J. H. TROUGHTON, who recently issued a little Brochure (entitled as above) for distribution among the Newmarket Gas Company's Consumers, has, owing to the large number of applications he has had for copies, been induced to RE-WRITE IT, with the object of making it SUITABLE FOR DISTRIBUTION IN THE DISTRICT OF ANY GAS COMPANY.
For further Particulars, apply to the Publisher WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

MAINLAYER AND FITTER.
WANTED, a Mainlayer, with experience in Erection of general Gas Plant. To a steady and reliable Man, the position will be permanent. Age under 40.
State References and Wages, to No. 3194, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a Gas-Works Foreman. Must be an experienced Man, and accustomed to Regenerator Furnaces and Machinery. Wages £2 per week.
Apply, stating Age and Experience, with Three recent Testimonials, to No. 3200, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CLEETHORPES GAS COMPANY.
WANTED, a capable trustworthy Man as WORKS FOREMAN. Wages 30s. per week, and House and Gas free.
Applications to be sent to the undersigned.
E. J. BROCKWAY,
Engineer and Secretary.

GAS-FITTER.
WANTED, a reliable House Fitter, Main and Service Layer, &c. Wages 25s. per week to commence. Permanency to a good, practical, steady Workman.
Apply, stating Age and Experience, to WM. O. JONES, Engineer and Manager, Gas-Works, Kingswinford, near DUDLEY.

WANTED, at once, a competent WORKING GAS MANAGER, to take the entire charge of Works making 18 million cubic feet. Salary £100 a Year, with good House, Coal, and Gas free. Applicants must produce at least three recent Testimonials.
Apply to the CHAIRMAN, 15, Hart Street, HENLEY-ON-THAMES.

TOTTENHAM URBAN DISTRICT COUNCIL.
GAS EXAMINER.
THE Tottenham Urban District Council invite APPLICATIONS for the post of GAS EXAMINER. Only those who are competent need apply; and preference will be given to those who have held a similar appointment under a Public Authority.
The Salary will be £50 per annum, payable quarterly; and the appointment will be determinable at three months' notice on either side.
The Testing-Station is at Wood Green; and tests will require to be made weekly.
Applications, in Candidates' own handwriting, together with *copies* of three recent Testimonials, to be delivered to the undersigned not later than Thursday, the 9th of February, 1899.
Dated, the 27th of January, 1899.
EDWARD CROWNE,
Clerk of the Council.
Offices: 712, High Road,
Tottenham, N.

GWYNNE & BEALE'S
PATENT
GAS-EXHAUSTERS AND STEAM-ENGINES
FOR FULL PARTICULARS, APPLY TO THE MAKERS:
GWYNNE & CO.,
Telegrams: "GWYNNEGRAM, LONDON."
HYDRAULIC AND GAS ENGINEERS
(Late Essex Street Works, Victoria Embankment, London),
Telephone No. 95 Holborn.
BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

THE Chertsey Gas Company require 1500 to 2000 Yards of 6-inch GAS SOCKET PIPES, delivered at Chertsey Station.

Tenders to the MANAGER, stating time required for delivery.

ON SALE—2000 Tons of Best Abram CANNELS.

For Particulars apply ACKERS, WHITLEY, AND Co., Bickershaw Collieries, Abram, near WIGAN.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS

GAS Plant for Sale, and cheap to clear—

RETORT IRONWORK — Several good Sets complete.

6-inch Vertical PIPE CONDENSER.

Four Wrought-Iron ANNULAR CONDENSERS, 32 in. by 18 ft. (Five Years old).

TOWER SCRUBBERS, One, 5½ ft. by 12 ft.; One, 8 ft. by 12 ft.; One, 5 ft. by 40 ft.

EXHAUSTERS, with ENGINES, from 2000 to 30,000 cubic feet per hour, guaranteed in working order.

PURIFIERS—Sets of 6 ft., 7 ft., 8 ft., & 12 ft. square.

STATION METERS, 6000, 10,000, 25,000 ft. per hour.

6-inch STATION GOVERNOR.

RACK and SCREW VALVES—Four-Way, Six-Way, and Centre Valves in Stock.

STORAGE TANKS for Tar and Liquor.

Address J. FIRTH BLAKELEY AND Co., Ravensthorpe, DEWSBURY.

HINCKLEY URBAN DISTRICT COUNCIL.
(GAS DEPARTMENT.)

TENDERS FOR CAST-IRON PIPES, &c.

THE above Council are prepared to receive TENDERS for the supply of 4, 6, 9, 14, and 16 inch CAST-IRON PIPES and SPECIALS.

Full Particulars may be obtained from the Manager, Gas-Works, Hinckley.

Tenders, endorsed "Cast-Iron Pipes," to be sent in to me not later than Feb. 4, 1899.

By order,
J. W. PRESTON,
Clerk.

Jan. 27, 1899.

BOROUGH OF NELSON.
(GAS DEPARTMENT.)

THE Gas Committee of the above Cor- poration invite TENDERS for the supply and erection of a GAS CONDENSER at their Brierfield Gas-Works.

Plans may be seen, and copies of the Specification, Form of Tender, and further Particulars may be obtained at the Office of the Engineer, Mr. William Foster, Nelson, Lancashire.

Sealed Tenders, endorsed "Tender for Condenser," to be sent to my Office not later than Twelve o'clock noon on Tuesday, the 14th day of February, 1899.

The Committee do not bind themselves to accept the lowest or any Tender.

By order,
R. M. PRESCOTT,
Town Clerk.

Town Hall, Nelson,
Jan. 25, 1899.

BARRY URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

TO MAKERS OF STEAM-PUMPS.

THE above Council are prepared to receive TENDERS for the supply and fixing at their Pumping-Station, at Biglis, near Cadoxton, Barry, a HORIZONTAL STEAM-PUMP. Triple Expansion, Surface Condensing, capable of delivering 500,000 gallons per twelve hours against the heads of Water: High Level 320 feet, Low Level 200 feet.

Further Particulars can be obtained from the Water-Works Engineer, Mr. E. W. Waite, Assoc.M.Inst.C.E.

Tenders, endorsed "Tender for Pump," together with Drawings and other Particulars, also date when Pump could be delivered, to be addressed to the Chairman, Gas and Water Department, Barry Urban District Council, and delivered on or before Monday, Feb. 13, 1899.

The Council do not bind themselves to accept the lowest or any Tender.

Gas and Water Offices, Barry,
Jan. 24, 1899.

HORNSEY GAS COMPANY.

SALE BY AUCTION OF £5676 £4 PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY AUCTION, at the Mart, Tokenhouse Yard, London, on the 28th of February next, £5676 FOUR PER CENT. DEBENTURE STOCK, in accordance with the Provisions of the Hornsey Gas Order, 1884.

The Stock must be paid up in full on or before the 14th day of March, after which date Interest will commence to accrue, to be payable, with the Interest of the existing Debenture Stock, on the 1st of July and the 1st of January in each Year.

Particulars and Conditions of Sale may be obtained on application at the Offices of the Company, 63, Chancery Lane, London, W.C., or of Mr. Alfred Richards, Auctioneer, 18, Finsbury Circus, London.

By order,
S. J. WILLIAMS,
Secretary.

Chief Offices:
63, Chancery Lane, W.C.,
Jan. 25, 1899.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

£150,000 OF THREE PER CENT. CONSOLIDATED DEBENTURE STOCK OF THE GASLIGHT AND COKE COMPANY.

To be issued under the provisions of The Gaslight and Coke Company's Act, 1876, and The Gaslight and Coke Company's (Capital Consolidation) Act, 1898.

This Stock is a PERPETUAL DEBENTURE STOCK, bearing Interest in priority over the Dividends on all the Preference, Maximum, and Ordinary Stocks of the Company, and offers an

INVESTMENT OF THE SOUNDEST CHARACTER.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, Tokenhouse Yard, E.C., on Wednesday, Feb. 8, 1899, at Two o'clock precisely, in Lots.

Particulars and Conditions of Sale may be obtained of the SECRETARY AND GENERAL MANAGER of the Company, at the Company's Offices, Horseferry Road, WESTMINSTER, S.W.; and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

By order of the Directors.

DEBENTURE, PREFERENCE AND ORDINARY STOCKS OF THE GASLIGHT AND COKE COMPANY.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, Tokenhouse Yard, London, E.C., on Wednesday, Feb. 8, 1899, at Two o'clock precisely, in Lots—

£2405 OF THREE PER CENT. CONSOLIDATED DEBENTURE STOCK,

£2285 OF FOUR PER CENT. CONSOLIDATED PREFERENCE STOCK,

AND

£6360 OF ORDINARY STOCK

OF

THE GASLIGHT AND COKE COMPANY,

to be issued under the Provisions of The Gaslight and Coke Company's (Capital Consolidation) Act, 1898, and offering

INVESTMENTS OF THE HIGHEST CLASS.

Particulars and Conditions of Sale may be obtained of the SECRETARY AND GENERAL MANAGER of the Company, at the Company's Offices, Horseferry Road, WESTMINSTER, S.W.; and of Mr. ALFRED RICHARDS, Auctioneer, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the Plymouth and Stonehouse Gaslight and Coke Company, the Directors of the Hornsey Gas Company, and other Owners.

MR. ALFRED RICHARDS will Sell BY AUCTION, at the Mart, London, E.C., on Tuesday, Feb. 28, at Two o'clock—

PLYMOUTH AND STONEHOUSE GASLIGHT AND COKE COMPANY (A new issue by order of the Directors).—£10,000 of ORDINARY STOCK.

HORNSEY GAS COMPANY (A new issue by order of the Directors).—£5676 of Four per cent. PERPETUAL DEBENTURE STOCK; Also

STOCKS AND SHARES in the PORTSEA ISLAND GASLIGHT COMPANY, the WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY, and the WEST HAM GAS COMPANY.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

CASES FOR BINDING VOLUMES OF THE "JOURNAL"

(GREEN CLOTH, GILT LETTERED)

MAY BE HAD FROM THE PUBLISHER

Price 2s. each.

NOW READY.

Price, Bound in Cloth, 5s. 6d., Post Free.

— SIXTEENTH YEAR —

THE

COMPLETE REPORTS

OF

PROCEEDINGS

OF THE

DISTRICT ASSOCIATIONS

OF

GAS ENGINEERS & MANAGERS

OF THE UNITED KINGDOM

FOR 1898.

The Fifteen previous Volumes are still on Sale.

LONDON:

WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

THE Acetylene Illuminating Company, Limited, 63, Queen Victoria Street, London, E.C., GIVE NOTICE that they hold the BRITISH PATENT RIGHTS for the MANUFACTURE OF CALCIUM CARBIDE by means of the electric furnace, that they are bringing an action against the Midland Acetylene (Parent) Syndicate, Limited, to restrain them from so manufacturing that product, and that they intend in the future to bring actions against all infringers of these Patents and all purchasers or users of Carbide of Calcium made in infringement of the same.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

READ HOLLIDAY AND SONS, LIMITED, Acetylene Gas Engineers and Carbide of Calcium Manufacturers, HUDDERSFIELD.

NOTICE.

THE Acetylene Illuminating Company, Limited, having published and issued an advertisement or circular claiming that they hold the British Patents for the Manufacture of Calcium Carbide by means of the Electric Furnace, we guarantee to indemnify anyone who buys Carbide from us against any claim by "The Acetylene Illuminating Company, Limited," or anyone else.

TINKER AND HOLLIDAY, LIMITED, Carbide of Calcium Manufacturers, HAZELHEAD, SHEFFIELD.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the "Albion Tavern," Aldersgate Street, London, E.C., on Friday, the 17th day of February, 1899, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 31st of December last, to declare a Dividend for the same period, to elect two Directors and One Auditor in the place of those retiring by rotation, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 3rd day of February until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
Feb. 1, 1899.

SUNDERLAND AND SOUTH SHIELDS WATER COMPANY.

IMPORTANT SALE

OF

WATER STOCK.

TO BE SOLD, by Auction, in the Long Room of the Queen's Hotel, Fawcett Street, Sunderland, on Thursday, Feb. 23, 1899, at Two o'clock in the Afternoon prompt,

MR. ATKINSON GIBSON, AUCTIONEER,

NEW STOCK (Maximum Dividend 5 per cent.) authorized to be created and issued under the powers contained in the Sunderland and South Shields Water Act, 1891, of an amount to raise

£18,100.

The above Stock will be entitled to Dividend from the 1st day of January, 1899, and be registered in the name of the Purchaser free of charge.

A Deposit of 10 per cent. will be required at the time of Sale; the remainder to be paid on or before the 1st day of March, 1899.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

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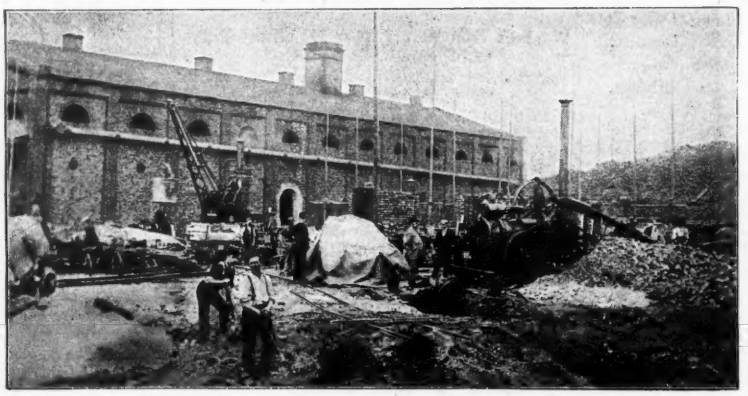

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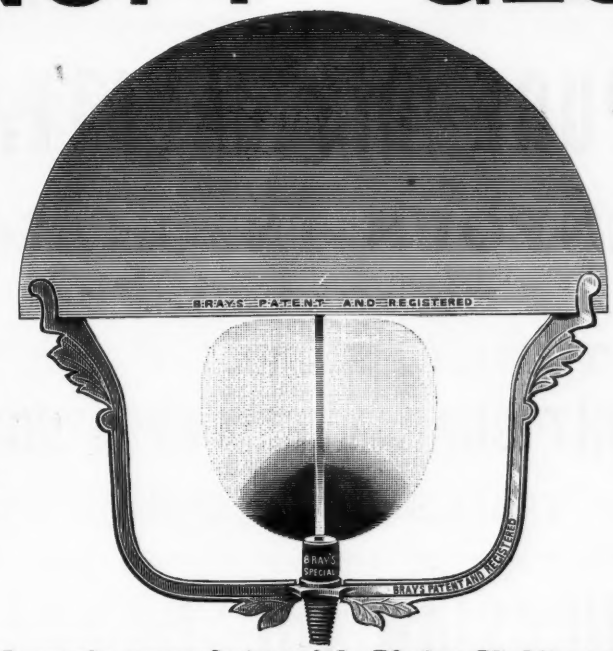

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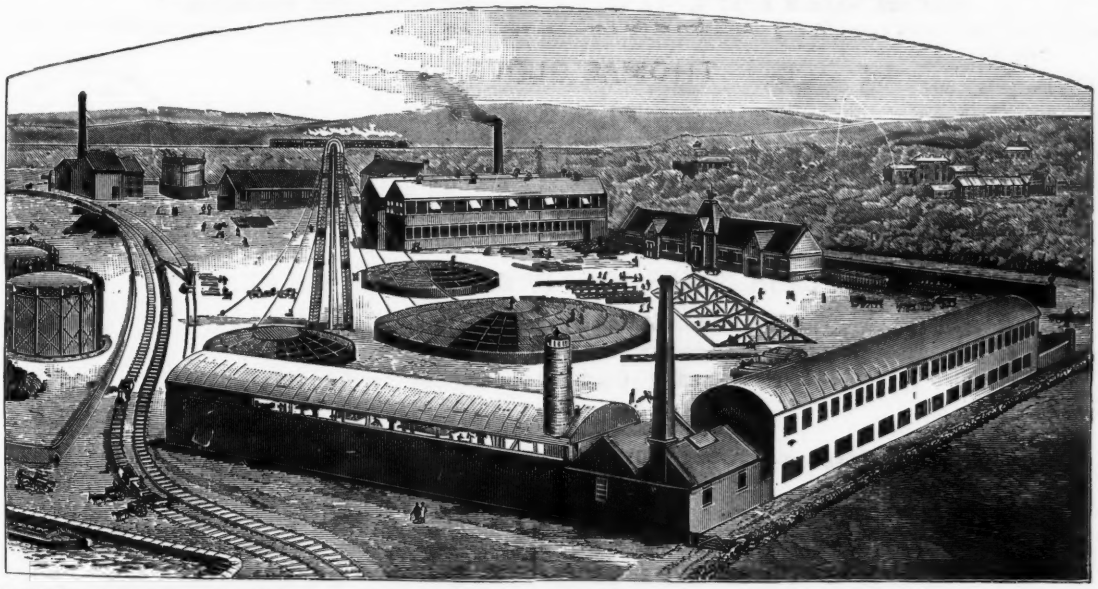

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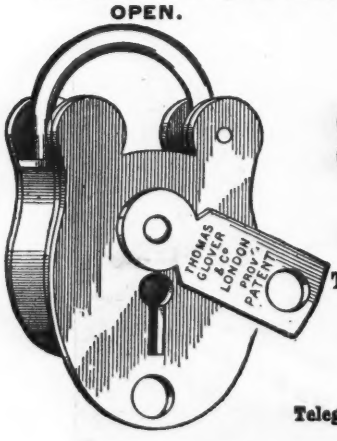

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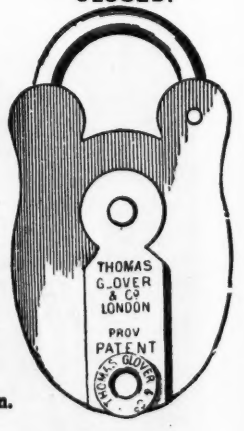

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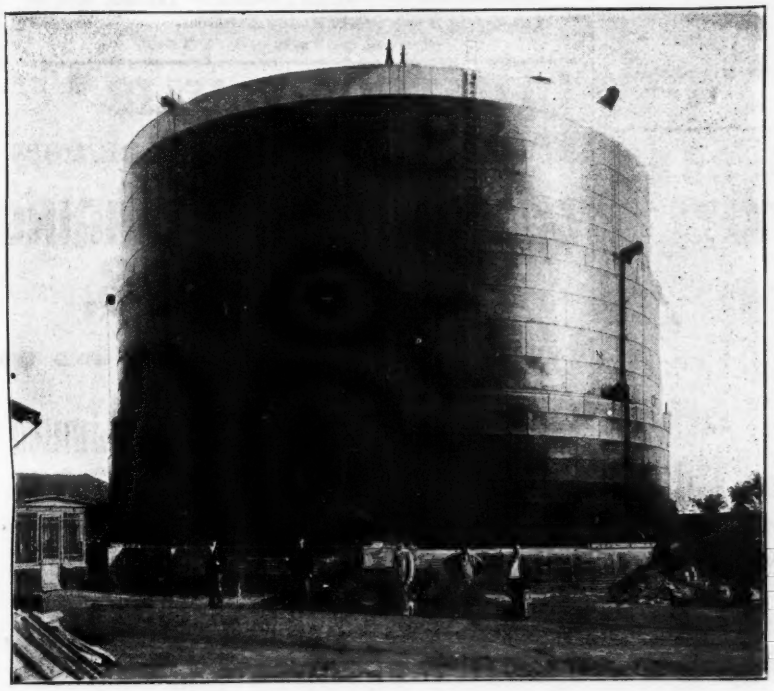

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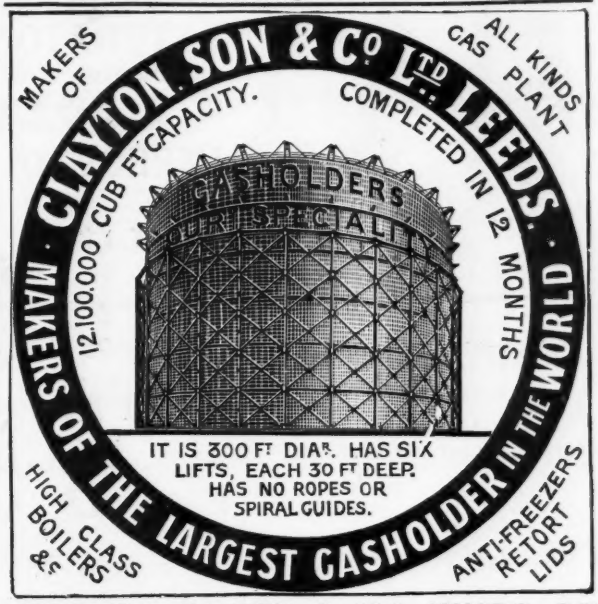
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Water being the cooling medium, the temperature of the gas can be kept under control better than with air; and the gas can be sent forward to the purifying plant at the proper temperature for efficient and economical purification.

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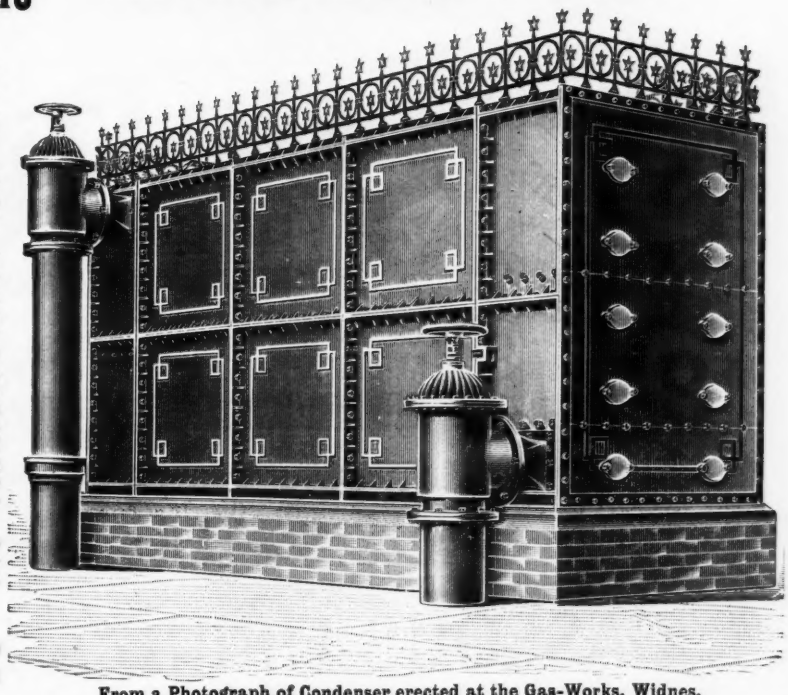
R. & J. DEMPSTER, LTD., recommend this Condenser to be used as a Finishing Condenser, after the gas has already passed through the ordinary Annular or Air Condensers.

Condensers of this type equal to 10,500,000 cubic feet per 24 hours already erected and at work.



From a Photograph of Condenser erected at the Gas-Works, Widnes. Capacity 1,500,000 cubic feet per 24 hours.

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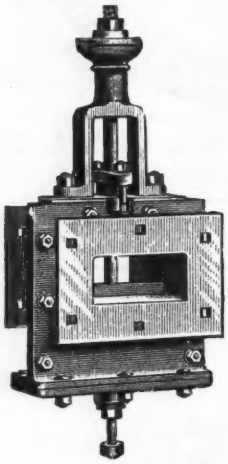

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